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UNIVERSITY OF ALBERTA

CHANGE IN SERVICE CENTERS IN THE MEDICINE HAT SETTLEMENT SYSTEM

by

PAMELA SHAW

©

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

DEPARTMENT OF GEOGRAPHY

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Dr. K.J. Fairbairn

Dr. D.B. Johnson

Dr. E. Murray

Date. April 19, 1995

ABSTRACT

This study considered a system of service centers organized around Medicine Hat, Alberta. The purpose was to examine growth predictability for small centers on the Prairies.

The viability of the centers was measured by functional score. The centers were evaluated at five points: 1950, 1960, 1970, 1980 and 1990. The impact of location relative to Medicine Hat and improved roadways was expected to contribute to growth predictability. As well, the intrinsic value of a high initial functional score was anticipated to be a catalyst for further growth, or at least ward off decline.

Although the hypotheses did not wholly predict growth performance, the service centers at the highest levels of the system appear assured of growth. Those centers at the lowest levels of the hierarchy appear to be destined to decline. Eventually, the smallest centers will cease to provide service and will disappear from the retail landscape.

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CHAPTER I

CONTEXT AND OBJECTIVES

INTRODUCTION

"Once a permanent urban hierarchy is established, it continues to change."

(Berry and Parr, 1988, p. 157)

The urban settlement system on the Prairies has undergone constant readjustment since the settlement period of the early 1900's. This settlement system was characterized by a high proportion of small, closely spaced service centers containing basic retail and service facilities to serve the needs of the rural consumers. The original settlement pattern was established to serve a large rural population. This population base no longer exists. In fact, rural economies have been under considerable stress for many decades due to rural population decline and the impact of other factors causing change in Prairie service centers.

Today, rural population constitutes less than one quarter of the total population on the Prairies. Rural population across North America continues to decline or stagnate, while urban population increases. Technological advances in agriculture, transportation and communication

have had profound impacts on rural life. These societal level changes have led to unintended, unfavorable circumstances for many of the small centers which dot the Prairies. Changes in mechanization and agriculture have resulted in land consolidation and the loss of rural population (Furtan and Lee, 1977). The urbanization of consumer needs has extended the range of rural shoppers (Stabler, 1987). Improvements to the transportation network have enabled rural residents to travel quickly and safely to more distant, larger centers, bypassing the small service center.

This study explores the forces and sources of change occurring in the system of communities contained within the trade area of Medicine Hat. Following an overview of the literature on settlement system change, this thesis focuses on the particular factors which have had a greater influence on the current "success" of services centers and on the settlement system of Medicine Hat as a whole.

Much of the literature on settlement systems (to be reviewed in Chapter 2) investigates change from a central place theory perspective. In general, these studies hypothesize that change in a single variable affects the equilibrium of the entire central place hierarchy. In studies of rural based settlements systems similar to the trade area of Medicine Hat, researchers have attributed

change to a number of different variables. However, few reports compare systems at more than two points in time. Stabler (1987) did examine changes to service centers in Saskatchewan over several decades. His is among the few papers which attempt to go beyond a static reporting of the settlement system to a dynamic analysis of the combined influence of more than one factpr affecting change in service centers.

The volume of literature published on small center decline has itself declined since the 1970's. It may be that everything that can be written on population decline in small centers has been done; that researchers are not finding new insights into population or other single variable caused change in small centers.

This study, however, revisits the problem for two reasons. First is because small center decline continues to occur. Reductions in population and level of servicing have not ceased. It is likely that, as rural population decline continues and as services continue to close or relocate to larger centers, many of the small service centers will simply cease to exist.

Second, as previously stated, this study attempts to go beyond single variable analysis to considering the spatio-temporal process which results from the combined interaction

of a number of independent factors on the small service centers.

Although fewer papers are being published on this topic, the problem has not lessened in importance for small center residents, the centers themselves, or the settlement systems they belong to.

Some difficulty exists in defining every possible factor involved in change in service centers and settlement systems. Previous research has focused on three primary variables. These are: increased efficiencies in agriculture and technological products; improved communications; and demographic trends. None of these (or other less frequently examined variables) can be reduced to one discrete event affecting one direct result in a simple cause and effect relationship. Instead, this study will hypothesize that several variables have, in combination, altered the function of urban centers on the Prairies and in turn, reorganized the system of urban settlements into a hierarchy of fewer, larger, more equipped urban centers.

This thesis examines change in the urban centers in the trade area of Medicine Hat. Instead of concentrating on the spatial pattern of settlements- the form of the urban hierarchy, as is the subject of much of settlement system research- this study will focus on the factors which alter the settlement system. That is, this thesis will focus not

on the product of change but will examine the independent variables which promote change, altering the ability of the small centers to provide goods and services.

The research is expected to show that the hierarchy has evolved from a system with many small centers with a wide dispersion of low order goods and services to a more centralized system of fewer, larger centers. As well, it is expected that the distribution of goods and services will have "urbanized" to the larger centers. That is, fewer goods and services will be available in the remaining smaller centers as the larger centers usurp custom and functions from the smaller centers. Change will result from the combined impact of more than one independent variable acting in unison on the service centers.

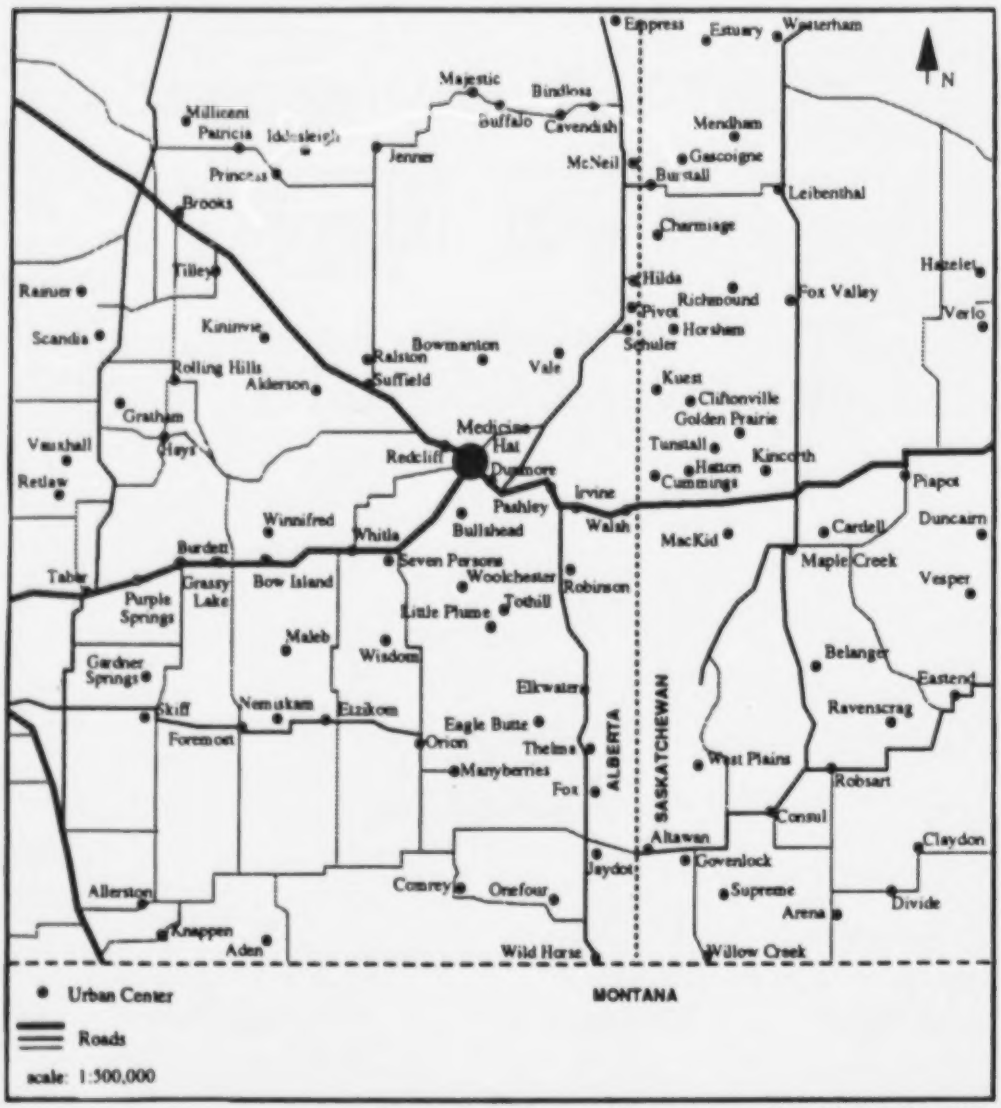
THE GENERAL CONTEXT

The role of the Prairie service center has been significantly altered in the post-World War II period. Changes in consumer demand for goods and services and the ability of consumers to meet new demands with minimal effort have produced a virtually total reorganization of the means by which goods and services are distributed. In many Prairie settlement hierarchies, the small rural centers have all but ceased to function as service centers. Instead, they "...prevail in an altered form, remaining part of the

settlement system on the Prairies" (Johansen and Fuguitt, 1984, p. 2).

Initially, the principal function of early Prairie settlements was to assemble and distribute basic goods and services to small center and hinterland residents (Hartshorn, 1988, p. 274). To meet the needs of consumers, the majority of early rural service centers contained a train station, grain elevator, and a general store. More complex centers, those drawing on a larger threshold population and trade area, provided a lumber yard, hardware store, implement dealer, and banking services. The largest urban centers, often the rail line divisional points, added services such as a newspaper, barber, cafe, bar, and a pool hall (Artibise, 1979, p. 250). Few towns were located beyond a narrow ten mile band-width of the railway lines, as location was limited by dependence on the railways for supplies. As well, travel distance was determined by the practical one day travel speed of the horse and cart, making a closely spaced system of service centers necessary (Mackintosh and Jeorg, 1934, p. 57). The number and location of original study area centers, shown on Map 1, were consistent with the communication requirements, consumer demands, and transportation limitations of that time (Stabler, 1975, p. 1).

MAP 1: LOCATION OF PLACES EVER PRESENT IN THE STUDY AREA



source: Provinces of Alberta and Saskatchewan, Base Maps 1950-1990

Table 1.1: Average area of farms, number and age of operators, Alberta 1951-1991

	1951	1961	1971	1981	1991
acres	530,000	640,000	790,000	813,000	871,000
hectares	212,000	256,000	316,000	329,000	362,000
# of operators	57,989	58,860	62,702	58,056	54,121
% of operators reporting age <44	49.2	44.7	40.8	45.0	42.3
% of operators reporting age >44	50.8	55.3	59.2	55.0	57.7

Source: Agricultural Indicators, Statistics Canada 1951-1991

The shift to an urban-centered society from a rural focused landscape was slowed by the Depression and World War II. The following decades, however, were characterized by the widespread acceptance of a number of mechanical and scientific innovations which revolutionized the means of production and distribution. As agriculture increasingly relied on mechanized methods, productivity per person increased and fewer farm workers were needed. Bollman (1988, p. 43) stated that the consolidation of farmland among fewer and fewer operators is expected to continue. Lack of opportunity for younger population in rural areas has contributed to the out-migration of population to urban centers where new employment opportunities in industry and the service sector could be found. Table 1.1 illustrates

this increase in farm size, decrease in the number of farm operators, and the aging of operators As well, the technological shift from the horse and cart to the automobile extended the practical "action space" of the rural resident, effectively decreasing the actual and perceived distance between rural areas and urban centers. Larger centers became more accessible to both rural and small center residents.

Economic factors, such as the prosperity of the post-war period, increasing real incomes, and higher standards of living increased the demand levels for higher order items. Goods that were formerly non-existent or inaccessible to the majority of consumers became more affordable and demand increased. In comparison, the inelastic demand for basic goods (those available in lower order centers) declined relative to the demand for goods and services available in larger urban centers. As an example, the demand for cloth, a staple item in small center general stores, decreased as "ready to wear" items, available in larger service centers, became more affordable due to changes in production and distribution. As well, consumers became less interested in canning equipment and more interested in canned goods, as the cost of prepared foods decreased and the relative affluence of consumers increased. Many of the factors which had negative impacts on small centers and positive impacts

on medium or larger centers were the unintended consequences of the acceptance or adoption of changes which first appeared unrelated to the evolution of service centers.

Consumers now require the convenience of both a wide array of products and the availability of very specialized products. To meet changing demands, retail and service establishments have evolved to provide both large scale generalized facilities and small, specialized establishments. As both the new "general" stores and the specialized stores require large and diverse markets, the establishments centralize in larger urban centers where they can reach threshold populations sufficient to support them.

CHANGE IN SERVICE CENTERS

The reaction of service centers to the variables forcing change can be either positive or negative. Growth implies a positive change; an increase in size, weight, or volume, a cumulative change in quantity or number, or a "good" result. Conversely, decline is a decrease or a reduction in measurement units. It denotes a relative or absolute loss, a decrease in quantity, or a decline in size, weight, and volume; a "poor" result (Lotz, 1977, p. 55).

A number of settlement system studies have measured change strictly as population growth or decline in urban centers (see Table 1.2). Studies conducted by Harden, 1960,

Table 1.2 Population in Medicine Hat Settlement System 1951 to 1991

	1951	1961	1971	1981	1991
Bindloss	n/a	n/a	25	20	14
Bow Island	653	1,122	1,159	220	1,484
Brooks	1,648	2,827	3,986	9,439	9,433
Buffalo	n/a	n/a	13	9	7
Burstall	214	266	507	550	451
Consul	105	172	205	153	114
Dunmore	102	104	64	113	200
Elkwater	53	99	98	89	98
Empress	411	405	352	299	229
Etzikom	89	101	92	69	78
Golden Prairie	222	257	270	118	67
Hays	179	141	125	118	91
Hilda	169	194	82	75	43
Iddesleigh	35	39	15	18	14
Irvine	224	240	194	360	326
Jenner	n/a	n/a	61	55	35
Leibenthal	n/a	n/a	17	15	6
Maple Creek	1,638	2,291	2,268	2,321	2,334
Manyberries	85	103	81	88	96
Medicine Hat	16,364	24,484	26,518	40,700	43,625
Mendham	158	231	141	76	43
Millicent	n/a	n/a	11	6	6
Onefour	n/a	4	4	4	4
Orion	54	27	17	10	11
Patricia	104	75	30	89	84
Piapot	245	246	160	95	71
Rainier	66	48	32	50	29
Ralston	455	780	357	475	413
Ravenscrag	n/a	n/a	22	25	19
Redcliff	1,538	2,221	2,255	3,876	3,768
Retlaw	n/a	n/a	23	12	9
Richmond	165	215	208	212	236
Robsart	107	110	52	34	26
Rolling Hills	142	171	127	175	164
Scandia	64	51	34	79	115
Schuler	131	156	97	105	88
Seven Persons	35	27	57	146	107
Suffield	259	130	70	200	182
Tilley	259	257	270	345	322
Walsh	115	97	59	70	69
Total	**26,088**	**37,691**	**40,158**	**60,913**	**64,511**

source: Statistics Canada
n/a- not available

Beale, 1977, Walzer and Schmidt, 1977 all used population as a measure of the viability of a center; a surrogate measure for the status or relative importance of a center. Although the relationship of population growth and decline to change in service centers will be examined later in this study, it will not be the sole variable used to measure the relative status of a service center in this thesis.

Ideally, if one accepts that the primary purpose of service centers is to provide goods and services to residents and the population of the surrounding hinterland, the most accurate measure of change in settlement hierarchy research would be the actual dollars spent in each establishment in each center for each year within the time frame considered. This would illustrate variations in consumer level demand and the ability of retail and service establishments to remain viable. This information, however, is not readily available. Therefore, this, an alternate method of identifying and measuring change will be used.

As the primary unit on the retail landscape is the individual store, the "establishment" or physical building in which the retail or service activity occurs, it will serve as the principal measure of growth or decline. This unit of analysis has been used by other researchers, most notably Hartshorn (1980, p. 337), Stafford (1963, p. 116), King (1962, p. 121) and Gibson and Reeves (1974, p. 152).

Establishments are also classified on the basis of primary function. Primary function is the "use" of the establishment. As an example, one establishment in Manyberries is used primarily as a post office. The site is also used informally as a coffee shop due to public access to a coffee pot. In this study, this establishment will be classified as a post office.

The presence of an establishment will be considered indicative of that establishment receiving a necessary level of consumer support. This study recognizes that it is likely that there would be a time lag between the loss of an adequate threshold population and the actual closing of the establishment. It may be true that operators of establishments in small service centers can withstand lower thresholds than operators in larger centers. Lower business and housing taxes, more permissive zoning allowing owner occupied buildings in commercial zones, the acceptance of lower standards of living and a lack of alternative opportunities may mean a small center operator could continue to operate an establishment long after an larger center operator would have closed the business. Since it would be extremely difficult to collect evidence for this hypothesis, it will be assumed that this measure will provide an accurate estimate of services available in the center.

As well as measuring change in the number of establishments and functions, this study will consider the type and range of functions available to consumers. Two levels of abstraction are considered. First, "simple change" is the addition or deletion of establishments or functions. It measures the relative or absolute difference, either positive or negative, in the number of establishments and functions in a service center and in the aggregate settlement system. Studies by Hart and Salisbury (1963) and Hodge (1982) previously considered the absolute addition or deletion in the number of functions as the measure of change in service centers.

Second, "complex change" is the addition of functions that differ significantly in characteristics or substance from existing functions, or the deletion of functions as they become obsolete or less important to consumers. As an example, video stores appeared on the retail landscape after the technology became widely accepted by consumers. This function was first established only in larger service centers, as adequate threshold populations were required to ensure profitability for store owners. Although the function has filtered down to mid-sized centers, it seldom appears in the smallest centers in a settlement hierarchy, as threshold populations are simply not available and small center retailers cannot provide the level of service

required by consumers. Other functions, such as the owner operated gas stations/auto-mechanic shops are disappearing as franchise outlets specializing in one aspect of automobile service are preferred by consumers. Self-serve chain store gas stations, franchise muffler outlets, and "jiffy-lube" service stations, all located in large service centers, have usurped custom from the one stop, full service automobile shops which were formerly found in a majority of small service centers. Complex change, then, measures those factors which alter the distribution of retail functions in the settlement system as new functions are created and formerly widespread functions disappear from the retail landscape (Boulding, 1953, Stabler, 1973).

Many of the studies (reviewed in Chapter 2) on change in service centers and settlement systems consider only the "simple" level of abstraction. A cross-sectional comparison of population or the number of services in a center at different dates conceptualizes growth or decline only at this simple level. By considering the addition of new functions which differ in substance from those previously present, this study also measures complex change. The attraction of new functions will be one measure of the relative status of a service center.

Although small rural central places continue to survive on the Prairie landscape, their decline is, in most cases,

inevitable as they cease to maintain their historic primary function as service centers. In the trade area of Medicine Hat, many of the smallest service centers contain few if any retail and service functions. The role of some of these small centers has been redefined as strictly residential nodes. Eventually, as their current population ages and assuming no in-migration occurs, the number of small rural centers will decline and these centers will disappear from the settlement system.

THE PROBLEM

"In any real world social or economic system, the forces leading to change are complex, as are the systems themselves."

(Keys, 1975, p. 2)

This thesis traces changes in functional content in the service centers in the trade area of Medicine Hat from 1950 to 1990, and shows the impact of influences such as relative location and original functional content on the centers. Some attempt at predicting the future for small centers on the Prairies will also be made. The scope of this review is necessarily limited to a particular urban settlement system and more strictly to an investigation of change in the smaller rural service centers.

Certain conditions will allow divergent responses among the centers. Change in the service centers will be illustrated by variations in the population size and functional content of the center, as influenced by the center's location relative to transportation routes and competing centers. It is expected that the population size of a center and its hinterland will be a factor in attracting in-migration and new functions, and in maintaining existing functions. Rural and small center residents continue to migrate to larger centers, although the rate of migration has slowed in recent decades. As small centers decrease in population and population in rural areas further declines, even the basic, low order functions, formerly available in small service centers, will either close or relocate to larger centers.

As well, the location and accessibility of the center, relative to other centers and roadways, will cause certain centers to benefit from the relocation of functions, the addition of new functions and increasing consumer mobility. Growing centers will be more easily accessed by consumers, will contain a larger and more diverse array of services and will be surrounded by a larger threshold population. Declining centers will be those which are isolated from connecting roadways, with fewer services and smaller populations within their trade areas.

No firm conclusions can be drawn at the outset, but it is expected that change in the service centers in the trade area of Medicine Hat will exhibit a tendency toward the spatial concentration of population and retail and service facilities to the larger centers. The lengthy time span considered and the investigation of several components of change enables a process oriented analysis, where change is not attributed to a single event or factor.

In this settlement system and as elsewhere on the Prairies, the decline of the small trade center and the reorganization of the settlement system is an adaptation to change, as "...fewer, larger, and more widely spaced centers can offer increasingly specialized services to the whole population in a more effective hierarchy." (Smith, 1982, p. 314). This comment serves as the expected conclusion to this thesis.

ORGANIZATION OF THE THESIS

This study expands on the following outline. Chapter II reviews the literature written on the readjustment of settlement systems to changing economic, technological, and socio-demographic forces. Spatial research, such as central place theory, is described to provide a basis for the discussion of change in settlement systems. Chapter III introduces the hypotheses developed primarily from two

sources: the literature and those variables influencing small center decline as identified by area residents. First, the study investigates the importance of initial advantage on the subsequent growth performance of the center. The second hypothesis examines the relationship between the proximity of a service center to rivals and to improved transportation routes, to determine if these factors bear any impact on the viability of the center.

Chapter IV presents the methods and data sources used in this study to discuss change in the settlement system. Chapter V investigates change in the settlement system. Following this, Chapter VI describes the results of the tests used to verify or refute the hypotheses. The hypotheses are then reviewed and evaluated. Chapter VII interprets the findings, presents the conclusions of this thesis, and the outlines the implications for future research.

CHAPTER II

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

INTRODUCTION

The literature on change in small service centers and settlement systems varies in terms of its objectives, conclusions, the characteristics of the systems under investigation, and applicability to the problem considered in this research. Because of the diversity of the literature, and the 'bias' of researchers as they follow different lines of inquiry, seemingly contradictory trends regarding the growth performance of small service centers have been identified. Some research suggests that small centers are growing; others hypothesize that small centers are declining. The purpose of this chapter is to review the research on change in service centers, focusing particularly on the studies which use measures that are meaningful to the study area considered in this thesis.

Empirical studies comparing complete settlement systems at more than two points are few in number. Bochert and Adams' study of the midwest (1963) and Hodge's research on Saskatchewan (1965) are among the few which attempt to look at change in entire settlement systems. Frequently, a single independent variable is credited with altering a

system of urban settlement. These studies on change in service centers and settlement systems, for the most part, compare the temporal or inter-place differentials of a single variable generally at only two points. Population size or the functional content of service centers are commonly considered variables used to describe change in a system of urban settlements, with change in status treated as the dependent variable. The use of a single causal variable results in a body of literature that contains many case studies but few investigations into the larger process by which the centers themselves and the spatial pattern of settlement are altered.

This study considers the combined, long term impact of two variables to obtain more information on the process of change. As will be more fully developed in the hypotheses in Chapter III, it is anticipated that the relative location of a service center and its functional content at the start of the time frame considered will determine its propensity to grow or decline.

STUDIES ON CHANGE IN SERVICE CENTERS

Central Place Theory

Pioneering studies on change in service centers measured the "centrality" or attractiveness of a central place

relative to other centers in a settlement system.[1] Researchers (most notably Christaller, 1966) hypothesized that the status of a central place is determined by its ability to provide goods and services to its own population and to residents in the area surrounding it.

Central Place Theory is widely used to explain the number, size and spacing of centers in a settlement system. The settlements are defined by the number and variety of goods and services offered. Theoretically, a good or service with the lowest threshold requirement will be found in all service centers. The good or service requiring the largest threshold population will be found only in the service center at the apex of the hierarchy. For example, a gas station would typify a good or service with a low threshold, one which requires a small range to maintain viability. Consequently, there are many gas stations in service centers and they are often the only good or service in the smallest service centers. An activity requiring a large threshold population, such as a specialized medical facility, will only be found in the largest service center.

The number of goods and services in a service center and the spacing of centers are a function of the demand for the

[1]In this study, the term "service center" will be used interchangeably with the term "central place" as discussed in Christaller's central place research. Both terms identify those centers which provide or have historically provided goods and services to their populations and hinterlands. Other central place terms, such as "threshold" and "range" will also be used in this thesis. The threshold of a center is the amount of purchasing power required to support a center and its retail and service activities; the range is the maximum distance a consumer will travel to obtain a good or service.

good or service, total population, population density, and the accessibility of the center. That is, a low population density is likely associated with low threshold activity in the region's service center.

As shown in figure 2.1, centers on the lowest level of the hierarchy provide the lowest order of goods and services. Communities on the next level of the hierarchy would provide those lowest order goods and services and an added bundle of higher order goods and services. Each successive level in the hierarchy offers a new bundle of goods and services. Central Place Theory states that a consumer will travel to the closest center which provides the necessary goods and services.

Table 2.1 Goods and Services by Level in the Hierarchy

Order of the Good or Service	Level of the Center					
	lowest	m-4	m-3	m-2	m-1	m
n						X
n-1					X	X
n-2				X	X	X
n-3			X	X	X	X
n-4		X	X	X	X	X
lowest	X	X	X	X	X	X

As shown in 2.1, "m" represents the level of the center, with the highest order center shown to the right. Each successively lower order center is represented by m-1, m-2, m-3, m-4 and the lowest order center. In this study, the levels would correspond to m representing Medicine Hat, m-1 representing the larger towns, m-2, the smaller towns, m-3 being villages, m-4, the hamlets, and the lowest order would be those population locales without hamlet status.[2]

"n" represents the order of the good or service. Higher order goods, those requiring a large range and threshold to remain viable, occur only in the higher order centers. Establishments representing the lowest order are those goods or services that could successfully locate anywhere in the hierarchy due to low threshold and range requirements.

"X" is the theoretical presence of a good or service in a center. That is, the lowest order center will contain only the lowest order goods and services. Each successively higher order will also offer these goods and services, while adding an additional bundle of goods and services. The highest order center will theoretically contain all the goods and services available in all the lower order center.

While central place theory provides a theoretical foundation for settlement system research, it should be recognized that the postulates of the theory are best suited

[2]As will be discussed later, these locales will not be explored further in this study as none were found to contain any retail or service establishments.

to a conceptual hierarchy. As noted by several researchers, the theory does not address the dynamic process of change in the settlement system. Hansen, (1977 p. 18), King (1971, p. 72), Haggett (1966, p. 96) and Berry and Parr (1988, p. 103) have each independently critiqued central place theory's static conception of the settlement system. Because of this constraint, it is often referred to as a "static equilibrium theory". Norris (1981, p. 1) adds that the problem with central place theory is it assumes that consumers make single purpose shopping trips with invariant frequency. Beguin (1992, p. 209) noted that the lack of "an explicit axiomatic approach prevents the theory from being consistent and fully immune to empirically based comments."

It is important, however, to recognize the usefulness of central place theory as a basis for research on change in service centers and settlement systems. No other theory focuses so strongly on the interdependence of service centers. Although this study does not solely rely on central place theory as a predictor of change in this settlement system, the basic underpinnings of Central Place Theory- the concepts of status, threshold and range- are used as they were defined by Central Place theorists to describe change in the settlement system.

Initial Advantage

A second area of research into change in service centers and settlement systems is the studies of the "initial advantage" of service centers. This research (Tarver and Beale, 1968; Hodge, 1965; Stabler, 1973) hypothesizes that centers with higher levels of servicing or population, or with a "better" relative location, will have an advantage in attracting growth when centers are competing for new services, population, or consumer support. Centers without perceived superior population, location, or servicing will be unable to compete for these benefits and will decline.

The variable most often used to measure growth and decline is the population of a center at the beginning of the study period. Population is used as a surrogate for the relative status of a service center. Stafford (1963, p. 163), Hodge (1966, p. 185) and Anderson (1950, p. 411) have all drawn correlations between service center population and facility decline in their research, stating that the initial advantage of population results in the superior growth performance of centers as measured by the availability of goods and services. In the process of change, competitive forces offer an advantage to certain centers at the expense of other central places (Northam, 1963, Tarver and Beale, 1968, Hodge, 1982). Places with a smaller initial population will support fewer services and will be less

likely to maintain or attract functions. As the small centers decline in population and services, centers with a larger initial population will attract their population, custom, and functions. Generally, as population declines, so does the number of services.

Relationships have been identified, as well, between the hinterland population and the support of rural service center facilities (Hart et al, 1988, p. 318). Declining rural populations are credited as causing the decline of retail and service functions in rural service centers. Several researchers (Hart et al, 1968, p. 318, Walzer and Schmidt, 1977, p. 45) have hypothesized that small centers depend on the threshold hinterland population to maintain "normal profits" for their functions. The decline of many small centers confirms that "...markets for retail stores in small towns have dwindled with the migration of rural residents." (see also Scott, 1968, p. 424, Harden, 1960, p. 206).

Higher crop productivity and livestock production, the gradual elimination of small, less intensive farming operations, and the steady decline of farm employment have reduced the man/land ratio required for crop and livestock production and have been major contributing factors in the depopulation of rural areas (Barr and Lehr, 1982, p. 269; Hodge, 1966, p. 195; Loftsgard and Voelkner, 1963, p. 59).

The corresponding result of a declining hinterland population is the loss of retail and service functions. Rural and small center residents become increasingly dependent on larger urban centers to fulfill higher order consumer needs (Fuguitt, 1963, p. 253, Coling, 1984, p. 264).

The concept of initial advantage in population has been successfully used to predict the growth or decline of centers in a settlement system. It is reasonable to argue that larger centers would offer benefits of agglomeration and access to a larger concentration of population and would attract new retail and service functions. New activities tend to be attracted to larger places where the best economies of scale can be achieved at "least risk" conditions (Webber, 1972, p. 205). As services become more specialized and larger threshold markets are required, functions would locate to larger centers where these thresholds are available (see Stabler, 1985, p. 1-3, Fuguitt, 1965. p. 312, Hassinger, 1957b, p. 253).

The initial size of a service center is not, however, its sole predictor of future growth or decline (Tarver and Beale, 1968, p. 21-22). Inertial forces act to slow the decline of service center and hinterland populations. Individuals remain in rural areas, held by mortgages, investments, or a preference for rural life. Researchers

have also suggested that from 1970 to the present, there has been a small scale trend to reverse migration (Bealer, 1981, p. 34). In studies where this trend has been identified, growth in small service centers has been initiated by non-farm residents who choose to relocate to small centers for a perceived lifestyle. This reverse migration does not, however, tend to increase the functional content of small service centers, as the new residents are more likely to be employed and patronize businesses in a nearby larger service center.

To the extent that a service center with a range of retail and service functions and an adequate population base will attract new functions, some correlation between population and growth in the functional content of the center is expected. However, population change is not a precise surrogate measure for change in retail and service activities. The initial advantage of size is, more accurately, an indicator of a generalized pattern of change, where larger places are more likely to grow and smaller places more likely to decline.

Influence of Relative Location

The advantage of relative location is a product of both the center's initial population size and the impact of technological advances in transportation on the center. The location of a service center does appear to influence its potential for growth or decline.

Improvements in transportation have enlarged the range of the consumer as the consumer increases his/her range of travel. The spatial competition among centers increases. Centers with some sort of locational advantage are then able to secure the custom of "disadvantaged" centers (Berry, 1959, p. 342).[3]

Varying conclusions have been drawn on the influence of relative location on the propensity for small center growth or decline. This variance, in general, depends on the measure used to determine change. When change is specified as an adjustment in the provision of retail and service functions, the influence of larger centers on small centers is generally negative. The dominant larger center usurps the functional content of smaller centers within its sphere of influence and exert a dehabilitating effect on proximate small centers (Berry, 1960, p. 112). This effect is inversely related to distance. That is, as distance from the larger center increases, the effect of the larger center

[3]Norris (1981, p. 1) hypothesized that the decline of hamlets was well established before the event of the automobile. In his research, the automobile contributed to but did not cause small center decline.

on the smaller center decreases. As discussed in Hodge (1966, p. 195), Dale (1988, p. 48), and Hassinger (1957, p. 232), small centers beyond a certain distance from the larger center are protected from the superior competitive forces of the larger service center.

Population is also an often used variable. When the distribution of goods and services shifts to larger centers, the population of smaller centers also centralizes to the larger centers. Higher initial population draws other population due to the locational and threshold advantages found in the larger centers. Wiedlich and Munz (1990, p. 83) hypothesized that local incomes depend on population density; individuals will move to larger more established centers to optimize their income.

Other research into population change in small centers suggests the contrary; that residents are leaving large centers for the perceived peaceful, possibly less expensive lifestyle found in small centers. These small centers, then, act as satellite communities for the larger centers, as documented by Fuguitt (1963, 1966) and Walzer and Stablein (1981, p. 2). The centers, however, no longer have a role in providing goods and services to their resident and hinterland population as trade is lost to outshopping by local residents (Lamont and Proudfoot, 1972, p. 9). A more recent study (Albrecht 1993, p. 233) also suggests that the

population of rural counties is again declining after a small reversal in the 1970's. In the settlement system of Medicine Hat, this appears to be true. For the smallest centers, decline is a more likely scenario than growth.

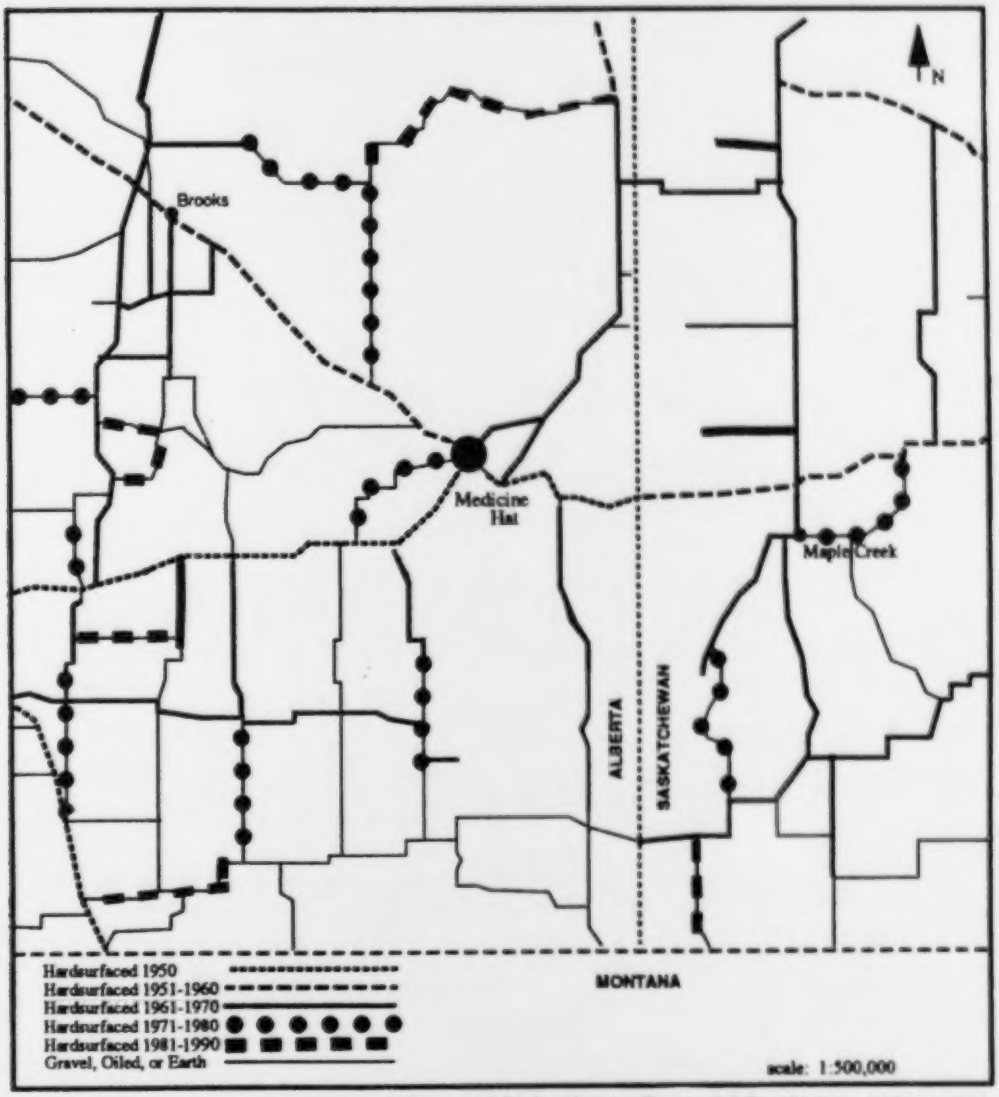
Generally, the literature on the relationship between relative location and service center growth and decline concludes that service centers are becoming more widely spaced and more evenly dispersed. Growth is more likely in centers which usurp custom from lower order neighbors, and which are at a maximum distance from rival centers. Small rural centers are disappearing as the larger centers in more advantageous locations increasingly draw population and functions from smaller centers.

In the trade area of Medicine Hat, as elsewhere on the Prairies, the advantage of relative location was a key element in the process of the survival and growth of certain service centers. The original settlement of the Prairies saw the establishment of hundreds of service centers, generally occurring every eight to ten miles along the rail lines. Relatively few, however, have grown beyond hamlet status. Those places that did grow tend to be relatively distant from competing larger service centers, and tend to have some locational advantage relative to other nearby small centers.

A situational advantage is also realized in the location of service centers relative to improved roadways. Although road mileage and the overall network of roadways have changed little since the 1950's, road quality has increased substantially (see Map 2). Improvements in road quality have, again, benefited larger centers. Since larger population centers generate more traffic, highway upgrading programs initially link larger centers, increasing their competitive advantage over smaller rural centers. Small centers can gain some advantage over other small centers, however, if they are located along a major roadway which connects larger urban centers. These small service centers are more likely to grow than less accessible rural service centers (Hobbs and Campbell, 1967, p.9).

The overall effect of increased road quality and increased speed of vehicle travel was referred to by Janelle (1973, p. 8) as "time-space" convergence. Consumers are able to travel increasing distances per unit of time expended. The impact of distance on consumer choice is weakened. Janelle found that places which improved their transportation links tended to show the greatest growth in wholesaling activities, when measured by sales volumes, number of establishments, or number of employees (1969, pp. 362-363).

MAP 2: CHANGES IN ROAD QUALITY IN THE STUDY AREA (1950 to 1990)



source: Alberta and Saskatchewan Provincial Road Maps, 1950 to 1990

It is expected that the same effect will be shown in the study area. The road network was largely in place at the start of the time frame considered in this study, but road upgrading between service centers differed over time and quality. Changes in road quality and the consumer's response to these changes is expected to result in higher functional scores for those centers located in advantageous positions along improved roadways.

The effect of "time-space convergence" has been both positive and negative for the rural resident. Although rural isolation has been mitigated by transportation improvements, these same improvements have enabled rural and small center consumers to travel to larger centers for goods and services. Rural residents obtained low order goods and services at the nearest low order service center were now able to bypass these centers and purchase their low and higher order goods in one shopping trip to a higher order center. Consequently, the rural resident has lost many of the services once available in small rural centers as the establishments did not maintain consumer support. As the constraints of travel decrease, so does the need for intermediate service centers.

Improvements to the transportation network expand the trade areas of larger centers (Clawson, 1966, p. 286, Marshall, 1964, p. 30, Hobbs and Campbell, 1967, p. 7, Abler

et al, 1971, p. 522) and smaller centers lose custom and retail and service facilities. Gas stations are often the only facility operating successfully in rural service centers. Although, as a low order function, these establishments require only a small population threshold to support them, they may be subject to abandonment as the efficiency of the gasoline engine continues to improve, and as traffic bypasses the small center. Unfortunately, these establishments facilitate trade with other centers rather than stimulate the economy of the small rural service center (Tyrchniewicz, 1988, p. 6).

Changes in Functional Content and Consumer Demand

As travel constraints decrease and standards of living increase, and as rural and urban consumer preferences become more similar, the assumption that a consumer will shop at the nearest center offering a particular function is no longer valid. Previously, studies in consumer behavior have not occupied a prominent place in the research on settlement system reorganization. More recently, however, behavioral theorists have suggested that increasing communication capabilities and changes in consumer behavior are also important forces which affect the reorganization of the settlement system (Boehm and Pond, 1976, p. 8, Reynolds and Wells, 1977, p. 31, Hodge, 1983, p. 24-27, Rushton, 1969, p.

68). Brown (1993, p. 387) added that shopping patterns are more strongly influenced by place of employment than place of residence.

The preferences of rural consumers have been altered by exposure through the media to an urban centered culture. Advertising by chain stores and franchises is standardized and efficient, and reaches beyond the resources of the local store (Johansen and Fuguitt, 1987, p. 92, Smith, 1982, p. 313). The consumer is prepared to incur the costs of transportation and time in order to gain the advantages available in a larger urban center as perceived through media influence (Berry and Pred, 1988, p. 99). This demand translates into new patterns of consumer movement.

The rural resident can better afford to accept these costs as the trend to larger scale, more mechanized farming increases per capita incomes. The mechanical revolution increased the farmer's productive capabilities, but encouraged his dependence on urban centered skills and services (Artibise, 1979, p. 258). Along with this, the growing complexity and expense of farm machinery requires that an implement center be large, modern, and serve a wide clientele (Fuguitt, 1965, p. 312). This leads to service consolidation, as a larger threshold population is required to support the implement dealer. Improvements to motor vehicles and road surfaces and increased vehicle ownership

also allow increased consumer mobility. As consumers travel to larger centers for higher order goods and services, the small center is bypassed for even the lowest order functions (Coling, 1984, p. 264, Barber, 1971, p. 90-91).

Stabler's (1973) investigation of complex change in small service centers examined whether a relationship exists, independent of the population of a center, between the types of functions present in service centers and their subsequent growth or decline. He anticipated that declining centers would be those with a high proportion of functions which themselves were prone to decline. His research did not support his hypothesis, however. Instead, he found the type of function did not act as a predictor for subsequent growth or decline. Other research into the influence of a particular function on growth or decline, such as Hodge's (1968) study on grain elevators, has also shown little evidence that the loss of a particular type of activity guarantees service center decline. More important may be the total range of functions available in the service center, or other independent factors such as population or relative location. Consumers may be more interested in the overall bundle of goods and services, and the ease of satisfying their consumer needs in one trip, than the presence or absence of a particular function. Again,

consumers could likely obtain the required goods and services in a higher order center.

SUMMARY

This chapter has reviewed the literature pertinent to the variables considered in this study; those identified as influencing the growth or decline of service centers. Deficiencies identified in previous research include the consideration of only one variable and the likely lack of concordance between the time span and the variable considered. Through the examination of two independent variables and the use of cross-sectional comparisons over a fifty year time span, it is hoped that these deficiencies may be reduced. As well, it is anticipated that the selection of a relatively isolated study area with an established hierarchy of service centers will also mitigate the deficiencies found in other studies.

This study will proceed with an investigation of the hypotheses, which are developed both from the studies of previous researchers and from the conjectures and anecdotal evidence of area residents on the variables affecting change in small service centers.

CHAPTER III

THE HYPOTHESES

INTRODUCTION

The goal of this study is to examine the changes occurring in the system of communities in the trade area of Medicine Hat from 1950 to 1990. It is expected that the research will show that the settlement system has reorganized into a hierarchy of fewer, larger centers with goods and services centralizing to larger centers. As well, it is expected that the initial functional content of the center and the center's location relative to other centers, will be predictors of the subsequent growth or decline of the center. The hypotheses presented in this chapter are intended to provide a formal means of testing these expectations.

The hypotheses are developed from two sources on change in the settlement system. First are the hypotheses of previous researchers who have examined similar settlement systems. Chapter II identified a number of researchers whose assumptions directly relate to the changes occurring in the settlement system considered in this study. This study, however, is not intended to replicate or test the work of any previous

researcher. Instead, general themes on change in service centers are selected from the literature and reconsidered in this study.

The second source of the hypotheses are the interviews with area residents. The residents indicated the factors they considered to be most influential in predicting the growth performance of service centers. As observers directly affected by small center decline, the responses of residents are a valuable contribution to the analysis. Although it is unlikely that their conjectures are based on any empirical, scientific research, long term residents are in the position to observe the direction, rate, and reasons for change. Their comments and the locations of interviews are outlined in Appendix A.

To fully examine change in settlement systems, a study should consider every event which produces a change in the system. Change, however, is not a discrete event, but the cumulative affect of many discrete events. This study will limit the analysis to two independent and one dependent variable.

The dependent variable specified in this study for all hypotheses is change in the number and type of functions available in each service center and in the settlement system as a whole. Two independent

variables are examined. First, is the concept of initial advantage; it is expected that centers with a higher initial population and a larger number of services at the start of the time frame under consideration will be more likely to grow. Second is the examination of the influence of relative location (to the largest competitor center and to improved road surfaces) on the growth performance of a center. It is assumed that a center will benefit from a location distant from competitors and adjacent to improved road surfaces.

Given the diversity of aims in the literature on settlement system reorganization, it is understandable that researchers have hypothesized on change in small centers by utilizing a variety of independent variables. Researchers have attributed small center decline to the automobile, farm mechanization, trends in retailing, and the urbanization of consumer behavior. Few studies, however, consider the influence of more than one independent variable.

This study attempts to go beyond a single variable comparison by hypothesizing on the combined influence of two independent variables. The point of the analysis is this: many factors act in concert to change the relative status of service centers in the trade

area of Medicine Hat. These variables differ in importance; certain variables will have more influence on growth performance in small centers than other variables. This study is based on the assumption that the two variables considered here are major contributors to the status of service centers. Although other variables, such as the mechanization of agriculture, may have been a major contributor at one time, it is likely the impact of this particular variable has 'run its course'. This analysis looks at two variables with more current impact on the settlement hierarchy.

It is expected that change in settlement systems is not a rapid process; the variables which alter service center status operate over a lengthy time span. To accommodate this, a forty year time frame is used in this study. It is expected that the span will be sufficient to provide an understanding of the influence of the variable.

Hypothesis One

The first hypothesis predicts that change in the individual service center and the center's current status results from the number and type of functions available in the center at the beginning of the study

period. This argument states that centers with a larger number of services (relative to other centers in the settlement system) offer greater economies of scale and benefits of agglomeration and will attract existing and new investment. As well, the initial functional content of the center will encourage the centralization of existing and new functions in that center. Growing centers, it is argued, will exert detrimental effects on surrounding centers, attracting the custom that has traditionally been available in the smaller centers. The centers closest to growing service centers will be most strongly impacted in terms of the decline in servicing. The effect of the growing center on other centers will decrease with increasing distance from the growing center. This process will continue to alter the settlement system, driven by consumer demand and enabled by improvements in transportation technology.

Change in the functional content of a service center affects both the center itself and the aggregate settlement system. It is hypothesized that service centers will become more widely dispersed, as fewer low order centers will be required to fulfill consumer needs. Larger centers will provide both the lower and higher order goods and services to consumers, and rural and small center residents will travel in multi-purpose

shopping trips to larger centers. Both existing and new functions will be attracted to higher order centers.

The empirical research and the conjectures of area residents can be generalized into one statement of intent. In the first hypothesis, the initial functional content of a center will be used as a surrogate for status. Both previous research and the opinions of residents predict that the relative initial functional score of a center will determine the likelihood of its growth or decline. Growth, measured in functional units, is predicted for centers with high initial functional scores. Service centers with low functional scores are expected to decline over the time period considered in this study. Centers with higher initial functional scores will attract new types of functions as they can provide the required large market threshold populations. These centers will also attract existing establishments that can successfully relocate from the smaller service centers.

It is likely that the relationship between initial functional content and subsequent growth or decline may deviate slightly in certain centers from the pattern predicted in the following hypotheses. Other forces of change may influence the effect of initial functional

content on the growth performance of a specific service center. As an example, a center with a relatively low functional score but distant from competing centers may maintain its relative status over the time period due to the lack of rival centers. However, as a generalization, it will be predicted that the highest scoring centers in the settlement system will show a tendency to the greatest growth.

Hypotheses One states:

> **Those centers with a higher relative initial functional score will gain or maintain status as functions centralize to these centers.**

The testing of this hypothesis will proceed using several means of analysis. The functional score of the center will be calculated and used as a measure of relative status. This measure of centrality will be tested on each central place in the urban hierarchy at five points in the 40 year time span under investigation. Both simple and complex change will be examined. That is, both change in the number of occurrences of a function and change in the type of functions available to consumers will be analyzed.

Hypothesis Two

The second hypothesis predicts that, in addition to the influence of initial functional advantage, locational utilities will cause disparate growth trends among service centers in a settlement system. Centers will lose or gain functions at a rate determined in part by the relative location of the service center. Mid to higher order trade centers distant from rivals and connected to lower order centers by good quality road surfaces will attract consumers. Service centers proximate to rival centers and located off improved road surfaces on poorer quality roads will decline.

Hypothesis two proposes that as the time it takes to traverse a given distance decreases, the traveler is more likely to travel that distance. This concept has been referred to as 'time-space convergence'(Janelle, 1973) and has been developed from predictable relationships between the temporal distance to a center and the consumer's ability to travel. As the temporal distance between two places declines, the expenditure to the consumer is reduced. In time-space convergence, the potential range of some centers will expand as technological improvements encourage lower cost consumer movement. The trade areas of larger centers will begin to encroach on those of smaller centers, and

the smaller centers will lose custom to their larger rivals.

As noted in Chapter II, highway upgrading programs first link larger population centers, improving consumer accessibility and encouraging functional growth. Consumers who previously could not practically travel to a distant center find that the center's accessibility has increased. The consumer will bypass a smaller center because the 'perceived cost' in travel time has been significantly reduced and so seems no longer important. As well, the consumer will be able to obtain a wider range of goods and services in a single shopping trip to the larger center. The decline of the small rural service center results from changes in the consumer demands and travel patterns of rural and small center residents.

Closely related to changes in consumer mobility are increased personal incomes and expanded leisure time. In addition, the range of mass media communications has increased substantially over the time period considered in this study. There are few practical limitations to the amount and type of information that can be received by a rural resident. All forms of telecommunications and printed matter can be easily obtained in any location in the study area. The rural resident is

inundated by the same flyers, newspaper advertisements, radio spots, and television commercials as the urban, large center resident. The perceived or real advantages of goods and services available only in larger centers draw rural and small center consumers to the larger service centers.

The relative location of the service center will be a factor in each individual center's potential for growth or decline. Small rural service centers within commuting distance of higher order centers and distant from improved roadways, will be in a negative functional location relative to other centers, and the functional status of these centers will decline. As the centers lose retail and service functions, they will cease to act as service centers. As some centers grow and others decline, the density of small trade centers in the study area will decrease.

It is possible that some service centers may evolve into a new form of settlement, possibly as residential satellites or resort centers. In the residential satellites, found in the shadow of larger centers, few functions are found. The population of these satellites commute for employment and consumer goods to the larger centers. In other instances, the relative location of a center is such that it can take up the

role of a resort community. The Town of Elkwater, located in the Cypress Hills, has a much wider array and higher number of functions than its permanent population should be able to support. However, the influx of summer residents, tourists, and skiers support the functions and cause the community to thrive. In this settlement system, there are few communities with the locational advantages of satellites or resort centers.

Changes in the spatial behavior of consumers pressure structural modifications in the settlement system. Fewer, higher order, more dispersed centers connected by superior road surfaces will evolve from the current settlement system. The trade areas of functionally higher scored centers in superior locations will subsume the trade areas of smaller neighboring centers. This growth is again self-perpetuating, generated by locational advantages and the center's functional competitiveness.

The following hypothesis states that the relative location of a central place in the hierarchy is a factor in its subsequent growth performance. Low order, poorly located centers will decline and larger regional centers will evolve to serve the consumer needs of rural residents. Isolated centers may

maintain their level of service provision if sufficient population density in the surrounding rural area is also maintained.

Hypothesis Two states:

That the relative location of centers will be a factor in central place growth or decline. Centers located on superior road surfaces will increase in functional score more rapidly than those located on poor quality road surfaces. As a corollary, centers more distant from superior or competitor centers will grow, while centers closer to superior centers will decline.

This hypothesis will be tested by examining road quality, time of road upgrading, and travel time between each service center and Medicine Hat. Again, all four sub-periods and the total time period will be examined. The influence of relative location and the subsequent growth or decline of individual centers will result in the structural modification of the settlement system surrounding Medicine Hat.

SUMMARY

The hypotheses proposed are intended to lead to a greater understanding of the changes affecting service centers in the study area since 1950. It is expected that the original functional score of a service center, and the direction of change in the functional score of that center, will covary with the relative location of the service center.

Although the hypotheses developed in this chapter predict the demise of the small rural center, it is unlikely that all small centers will disappear entirely from the Prairie landscape. Instead, the rural service center will be maintained in an altered form. Retail and service functions will centralized to larger regional centers or close, and rural consumers will travel to the larger centers to fulfill both low and high order consumer needs. New services will choose the locational advantages found in larger centers, again at the expense of the small centers. New types of retail and services will also locate in larger centers to meet threshold and range requirements.

Small centers may maintain a role as a population base or even as a retirement community for rural residents in the surrounding trade area. Eventually, however, the small center will likely decline to an

extent where it no longer offers goods and services, and all consumer needs will be satisfied in fewer, larger centers. The following chapters will more fully discuss the expected future of small centers on the Prairies.

CHAPTER IV

RESEARCH AND METHODS

INTRODUCTION

In this chapter the criteria by which the study area was determined, the choice of time period, and the sources of data are discussed. As previously noted, the intent of this study is to examine the changes occurring in the system of communities within the trade area of Medicine Hat. This analysis first considered all communities ever present in the trade area. The analysis was then limited to those centers actually acting as service centers within the time frame under consideration. The analysis now includes the thirty-nine communities, incorporated or unincorporated, with any good or service at any time since 1950. These thirty-nine communities were investigated for the test years 1950, 1960, 1970, 1980, and 1990. The selection of the study area and time period are discussed below. Data sources describing each community, the range of goods and services, and information on the relative location of each of these centers were obtained from a variety of sources. These data sources and their merits are also outlined in this chapter.

STUDY AREA AND TIME PERIOD

Determination of the Study Area

In order to meet the goals of this study, several considerations in the selection of a study area were identified. First, the region selected must contain a number of service centers to allow comparisons between growing and declining centers. The centers should serve or have served primarily as service centers for the surrounding dispersed rural population and for their own population. As well, the centers should interact in a functional, relatively self-contained settlement system, so change in one center could have some bearing on change in other centers and in the settlement system.

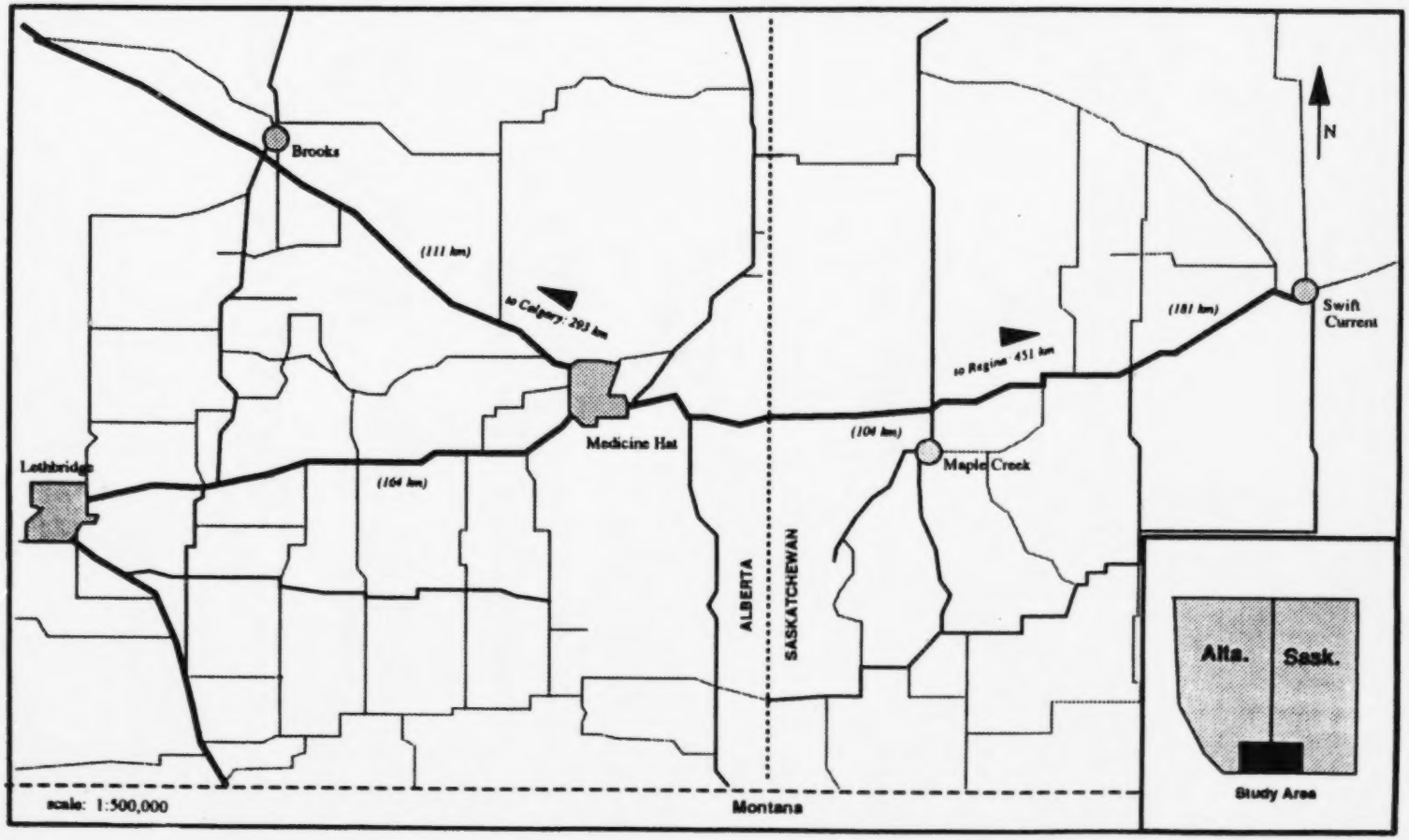
The system chosen for study was Medicine Hat and its associated hinterland, although other systems on the Prairies could have fulfilled these criteria. Calgary and Edmonton were not selected, as their influence and the size of their respective trade areas reaches beyond the useful identification of a relatively self-contained settlement system. The delineation of their trade areas is difficult as it could be argued that both centers provide goods and services to consumers across Alberta, the Prairies, and national and international markets. Particularly for higher order goods and services, these centers may be drawing custom from around the world. The smaller cities of

Lethbridge, Red Deer and Medicine Hat provide more suitable options for study. All three centers have grown rapidly in the post-war era both in terms of population and functional content. The influence of these centers on their hinterland population can be contained within a more limited area than Calgary or Edmonton. Each center is relatively isolated from competitors and acts as the major supplier of goods and services in its region (Kariel, 1970, p. 125). From these three centers, the trade area of Medicine Hat was selected.

Medicine Hat is the largest center in the southeast Alberta-southwest Saskatchewan region, both in population and in the number and array of retail and service functions. No proximate center challenges this primacy, as Medicine Hat is relatively isolated from any competing larger or similarly sized centers (Map Three). Smaller centers in the area are affected by competition for consumers from both Medicine Hat and other small competitor centers.

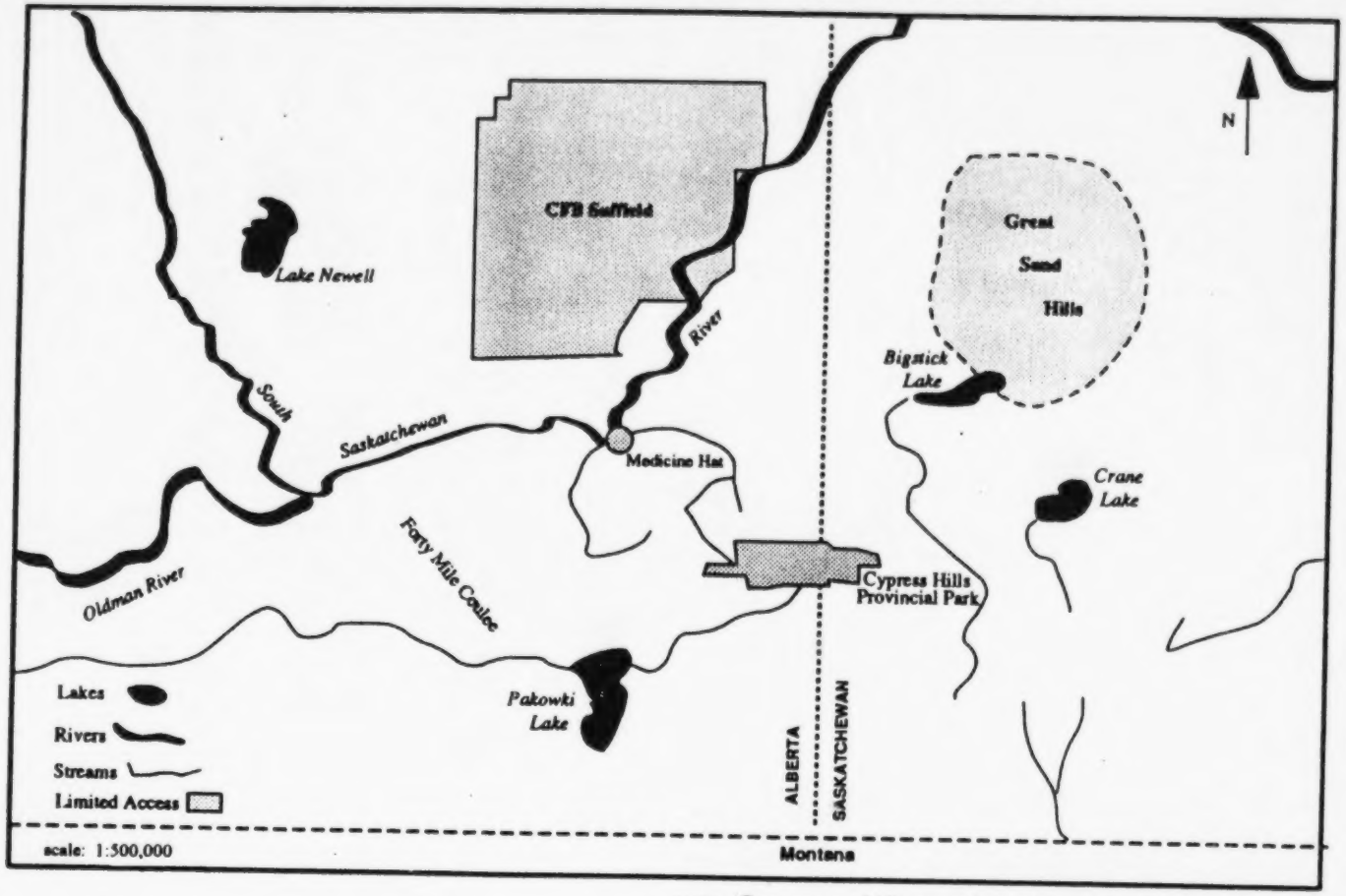
As illustrated on Map Four, the isolation of Medicine Hat and competition for trade among smaller centers in the trade area are further influenced by a number of geomorphological barriers. The Cypress Hills, a designated Provincial Park, provides a barrier to travel for residents as transportation routes through the Park are limited. Additionally, the Great Sand Hills, northeast of Maple Creek, provide a significant deterrent to travel for

MAP 3: LOCATION OF MEDICINE HAT RELATIVE TO POTENTIAL COMPETITORS



source: Governments of Alberta and Saskatchewan, Provincial Base Maps

MAP 4: GEOMORPHOLOGY OF THE STUDY AREA AND BARRIERS TO TRAVEL



source: Governments of Alberta and Saskatchewan, Provincial Base Maps

consumers. The coulees and watercourses that cross the landscape are significant barriers to consumer travel as they also limit route options and increase travel times. Travel times for consumers are influenced by these barriers and by the transportation routes available to them.

Anthromorphological barriers affect consumer travel, and ultimately trade center viability, as well. The Canadian Forces Base (Suffield) is a travel barrier for residents to the northwest of Medicine Hat. Blanket restrictions on civilian travel across the Base substantially increase traveling distances for consumers. The provincial border between Saskatchewan and Alberta, however, does not appear to be a deterrent to travel, as will be discussed below in the determination of the trade area. These natural and man-made features partially define the boundary of the trade area by controlling the travel patterns of area consumers.

Determination of the Trade Area

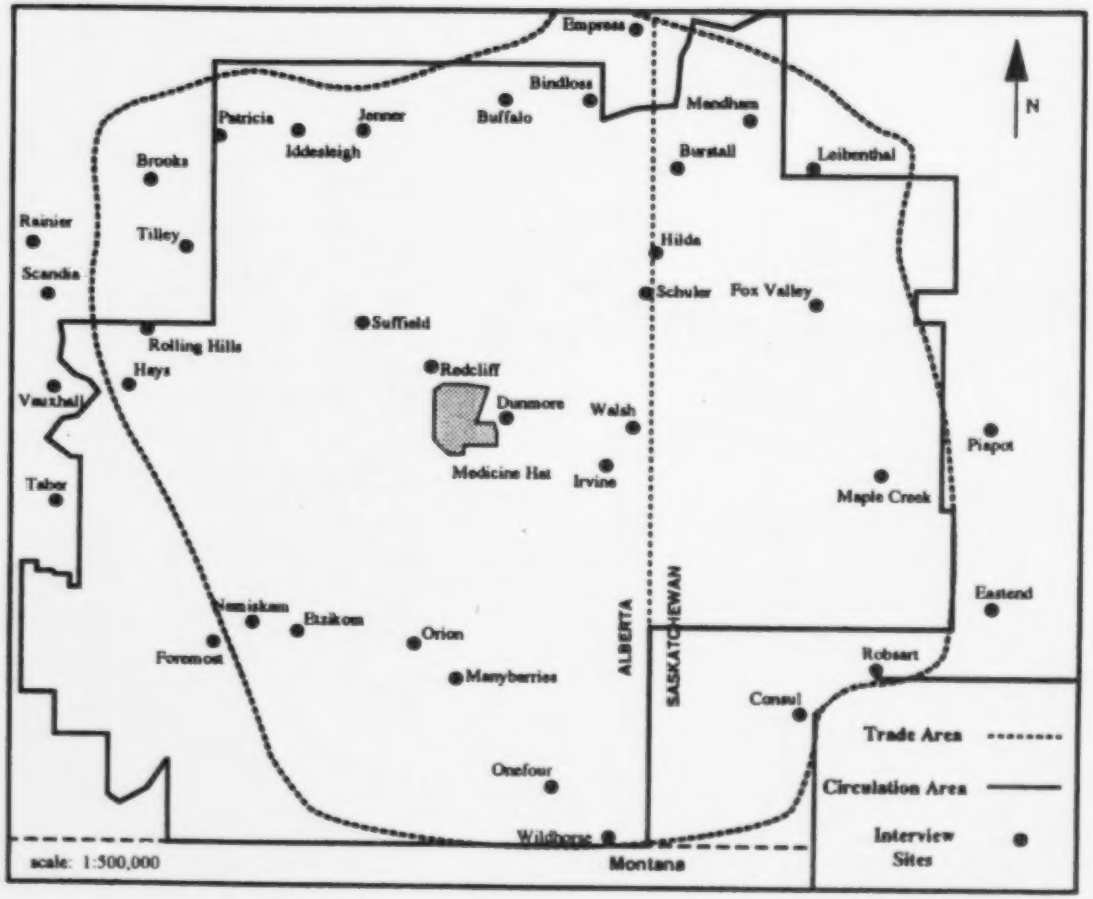
The means of trade area delimitation used to determine the range of Medicine Hat follows the methodology proposed by Dahmes and Forbes (1971). First, a line indicating the approximate trade area of the primary central place is selected as the initial range. Here, the circulation range of the "Medicine Hat News", the primary newspaper in the area, is taken as representative of the trade area of the

city (Southham Publishing, 1990). The circulation area is appropriate as it indicates the area most influenced by news coverage and print advertising from Medicine Hat and contains those consumers who either would likely travel to Medicine Hat to obtain the goods or services advertised or who identify enough with the city to purchase the newspaper.

As interviews with individual consumers would have been prohibitively time consuming, a more expedient method of verifying the circulation area as a surrogate for the trade area was determined. Informal interviews were conducted with retail store owners or employees in each center, where available, to establish that consumers in that center considered Medicine Hat as their primary destination to obtain goods and services not available in their own center. The forty-three interview sites are shown on Map Five. It was assumed that a retailer would be the most accurate source of information on levels of custom and servicing and that the interviewee would be familiar with the shopping patterns of residents in and around the service center. A summary of the interviews is shown in Appendix A.

The intention of the interviews was to determine those service centers which depend on Medicine Hat for goods and services not available in the service center. A second intention was to validate the theorized trade area. Where required, the trade area was modified in consideration of

MAP 5: TRADE AREA OF MEDICINE HAT, CIRCULATION OF MEDICINE HAT NEWS, AND INTERVIEW SITES



source: see text

the responses provided in the field interviews. The trade area, also shown on Map Five, represents the zone in which consumers are more likely to travel to Medicine Hat for goods and services instead of a competing center. As well, it shows the service centers which are influenced more by Medicine Hat than any other of Medicine Hat's competitor centers. It was determined that consumers from the smaller centers also patronized the mid-sized centers of Brooks and Maple Creek for goods and services not available in their centers. Residents of Brooks and Maple Creek generally patronize Medicine Hat for functions not available in their centers. Consumers outside the trade area delimited are more likely to patronize other centers outside the system than they would Medicine Hat. Those to the west are more likely to travel to Lethbridge; those to the east would tend to travel to Regina. While this technique of delimiting the trade area is undoubtedly inferior to a full scale consumer survey of residents in the area, it provides an acceptable level of accuracy for the purposes of this study.

A second consideration modifying the trade area were the previously noted barriers to consumer travel. Although the straight line distance between Medicine Hat and a smaller service center would be well within the normally accepted consumer travel range, the practical distance and time spent

in consumer travel meant that a center, other than Medicine Hat, may be the primary center patronized by consumers.

The trade area, truncated by the Canadian Forces Base (Suffield) and the international border, incorporates a large portion of southeastern Alberta and southwestern Saskatchewan. It corresponds to the trade area shape theorized by Beckman (1989, p. 81) who hypothesized that the size and shape of market areas are generally that of rounded hexagons. The service centers within the trade area all provide some level of consumer support to residents, at some time during the time period between 1950 and 1990.

Time Period Under Consideration

This study examines the changes that affected the settlement system of Medicine Hat between 1950 and 1990. The time frame was selected for two reasons. First, the temporal scale is likely sufficient to reveal accurate trends rather than erratic responses from the settlement system and permit the evolution of cause and effect relationships. Second, the start date selected excludes two events which altered normal trends on the Prairies. The Depression of the 1930's had massive negative impacts on the Prairie economy, consumer activity, rural population, and on the central places themselves as small center decline was exacerbated by economic conditions (Burnet, 1951, pp. 55).

The 1930's was characterized by a rate of change sufficiently beyond "normal" as to encourage the exclusion of this decade from the study. World War II did not affect the Prairie economy and settlement system to the same degree, but it did alter the normal statistics for number of farm workers and slowed the diffusion of new forms of farm machinery technology due to the unavailability of some consumer goods. For these reasons, this decade was excluded from the analysis as well.

Change in the post-1950 period on the Prairies tends to have been less influenced by world events on the scale of the depression and World War II. The units of analysis used to measure change are also likely more significant in the post war era. Previous to 1950, the mechanization of agriculture was a powerful influence on the Prairies. This change has less importance today, since mechanization is already accepted. The variables of initial advantage and relative location do still appear to have an impact on the direction of change and the future of small centers. The time frame considered, then, corresponds with the variables considered.

Change in the settlement system is the cumulative effect of many isolated events, taking place over a long period of time. It is expected that the forty year time span is

sufficient to reveal the changes which act on service centers and the settlement system.

DETERMINATION OF A HIERARCHY OF SETTLEMENTS WITHIN THE SETTLEMENT SYSTEM

Previous research on change in service centers has noted a number of regularities in the variations in growth behavior among individual centers. Researchers have predicted that lower order centers will disappear and the spacing of centers will become more regular. As well, researchers have suggested that the hierarchy of centers will polarize over time, with the middle ranks of the hierarchy disappearing as centers with grow or decline and disappear (Hodge, 1965, Stabler, 1973). It is expected that these tendencies may also prove to be true for the service centers in the trade area of Medicine Hat.

In this study, all centers ever present in the study area since 1950, which contained at least one good or service establishment, are included in the compilation of retail and service facilities. When compared to Map 1 of all places ever present in the study area, the number of centers considered in this analysis is substantially smaller.

A number of centers have simply ceased to exist. The Town of Alderson, as an example, once contained a wide array

of retail and service functions. Several hotels, a blacksmith, general store and livery were found along main street in the 1920's. However, when the service center was bypassed by improvements on what became the TransCanada Highway, the service center rapidly lost population and status. A fire in the mid-1930's expedited the decline of the center. Today, a couple of empty building foundations are all that remain of a once thriving center.

There are centers in the area which apparently never contained goods or services during the time frame under consideration. Although these centers may still be the focus for a small population, they are not included in the analysis as they do not act as service centers.

Different methods have been used in the literature to classify service centers into a hierarchy and test for change. Bochert and Adams (1963) classified the hierarchy based on whether or not a center contained a certain good or service. Hodge (1965) used the number of functions to determine placement in the hierarchy. A cluster analysis program was used by Stabler and Olfert (1992) to group communities into functional categories.

All these methods share similar problems. While it is possible to determine major breaks in the hierarchy and assign communities to a functional level, the distinctness and compactness of the levels will vary over time. When five

points are compared, the variance could make analysis difficult. As well, there is no certainty that the breaks identified best represent the movement of service centers across the hierarchy. Too narrow a break level, and the analysis becomes bogged down in detail and insignificant events take on significant proportions. Too wide a break level, and the analysis loses the detail needed to make comparisons.

The method used to determine the settlement hierarchy at each test year in this study is based on the functional content of each center. It replicates the method used in similar studies on change in settlement systems (Davies, 1967, Southeast Regional Planning Commission, 1987).

Each center was assigned to a level in the hierarchy, based on its functional score. The functional score of a center serves as a measure of the center's status, attractiveness, or centrality, with each retail or service activity contained in the center contributing to the functional score of the center. Each constituent unit of a function is summed with other functions in the central place, resulting in a functional score for that center. That is:

$$C = \frac{100t}{T}$$

where:
t= The number of units of a function in a center
T= the total number of that function in the study area
C= the functional score

If the functional score of retail or service activity equals 100, that means it is the only occurrence of the function in the settlement system. Possibly it is a specialized function available only in the largest center. A high order function, then, receives a high score. If there were 100 occurrences of a function (thus a low order function), the functional score would be 1 for each occurrence of that particular good or service. The scores for each function in a service center are summed to obtain a functional score for the center.

Levels in the hierarchy are determined from natural breaks in the range of functional scores for the centers, wherever these occur. If no natural breaks occur, the levels of the hierarchy are estimated from the distributions obtained in other test years, or artificially determined by hypothesizing on the functions that are normally available at each level of the hierarchy. As an example, if a hardware store was a function normally occurring in smaller towns for 1950, 1960, 1970, and 1990, it would be included at that level for 1980 although it was referenced only to the larger order centers. The number of centers at each level of the hierarchy can then be easily determined. Change in this number, as centers move up and down among the levels, can also be measured. If a center ceases to offer goods and services, it remains in the analysis for the rest

of the time period to see if any center ever regains functions.

Some interpretation of the functional scores are required, as the method can misrepresent the value of certain functions. For example, functions which are disappearing from the retail landscape receive a high functional score as they are found infrequently in the settlement system. Grain elevators, as an example, receive an increasingly higher score as the number of occurrences decrease over time. The instances where a functional score may require further manipulation to accurately portray the importance of the good or service is more fully considered in Chapter V.

SOURCES OF DATA

Previous researchers have investigated numerous variables which have been identified as factors altering settlement systems, service centers and the retail landscape. Data on population, a common variable in previous studies, was obtained from Statistics Canada Census information. The census is generally considered a reliable source of population information, and in fact is the only source for the majority of small centers.

Not all the variables considered by previous researchers, however, are equally amenable to measurement.

As well, not all variables require further analysis in this study, as this study will focus on initial advantage and relative location as predictors of change.

For example, change brought on by the mechanization of agriculture will not be further analyzed. Although increased efficiencies in farming practices have contributed to the decline of many rural service centers, this change has likely stabilized, and in any case, mechanical farming methods were firmly established by 1950 (Zimmerman and Moneo, 1971, p. 3). The influence of increased efficiencies in agriculture has declined to a point where other forces more strongly influence the reorganization of the settlement system. Farm size is not increasing as rapidly as in the past (see Table 1.1), and, as shown on Table 4.1, rural employment opportunities are declining very slowly. As well, rural depopulation is currently proceeding at a much slower rate compared to the rapid out migration of the 1940's, 1950's, and 1960's (Table 4.2).

Adjustments in consumer behavior, as well, was not specifically reviewed, as time constraints disallowed surveys of individual consumers. Instead, changes in patronage were inferred from adjustments in the number and type of retail and service functions provided in central

Table 4.1: Employed Labour Force, Primary Agriculture and All Industries, Alberta, 1976-1994

Year	Primary Agriculture	All Industries	% Agriculture
1976	118,000	859,000	13.7
1977	90,000	903,000	10.0
1978	87,000	967,000	9.0
1979	86,000	1,042,000	8.3
1980	86,000	1,116,000	7.7
1981	92,000	1,194,000	7.7
1982	85,000	1,173,000	7.2
1983	86,000	1,146,000	7.5
1984	97,000	1,149,000	8.4
1985	80,000	1,170,000	6.8
1986	81,000	1,189,000	6.8
1987	89,000	1,188,000	7.5
1988	92,000	1,224,000	7.5
1989	88,000	1,254,000	7.0
1993	93,000	1,277,000	7.3
1991	92,000	1,290,000	7.1
1992	84,000	1,285,000	6.5
1993	83,000	1,298,000	6.3
1994	81,000	1,337,000	6.0

source: Labour Force Survey, Statistics Canada. Data prior to 1976 is not directly comparable.

Table 4.2: Urban and Rural Population, Alberta, 1911-1991

Year	Total	Urban	Rural	% Rural
1911	374,295	137,662	236,633	63.2
1921	588,452	222,904	365,550	62.1
1931	731,605	278,508	453,097	61.9
1941	798,169	306,586	489,583	61.5
1951	939,501	449,675	489,826	52.1
1961	1,331,944	843,211	488,733	36.7
1971	1,627,875	1,196,250	431,615	26.5
1981	2,237,724	1,727,545	510,179	22.8
1991	2,545,555	2,030,895	514,660	20.2

source: Census of Agriculture, Statistics Canada

places. The following data sources were considered to describe the changes impacting service centers and the settlement system considered in this study: telephone directories, secondary directories, local histories, field study, and speed of travel data. The first four were used to establish the number and type of retail and service functions available in each service center; the fifth allowed the investigation of relative location and its impact on service center growth or decline.

The Functional Content of Central Places

For each service center, an attempt was made to compile an inventory of all functions which existed in the center in 1950, 1960, 1970, 1980 and 1990. Several sources were used to obtain an accurate description of the number and type of retail and service functions. Telephone directories are the primary source of information on change in retail and service provision. Local histories, the field study, and other listings such as Grain Commission directories are used to verify and substantiate the information provided in the telephone directories. The sources were checked against each other to ensure maximum possible accuracy. It is likely that not all functions were identified for each center for each study year, and potential deficiencies in these sources are identified later in this chapter. The sources however, are compared and combined to ensure that the final compilation accurately represents the current and historic distribution of retail and service functions in the study area.

Telephone Directories: The White Pages of the Alberta Government Telephone and SaskTel directories are the primary sources of information on retail and service provision from 1950 to 1990. Telephone directories are compared for each individual center for each year of analysis. The White Pages are used for data compilation, rather than the Yellow

Pages, as they supply a more complete listing of the retail and service functions available in central places and have been previously verified as a virtually complete source of business listings in previous research (Agriculture Canada, 1974, South East Regional Planning Commission, 1987).

Telephone directories provide more extensive listings than any of the more commonly consulted business directories. Scott's Business Directories, the Canadian Trade Index Directories, Henderson's Business Directories, and Dun and Bradstreet Directories were reviewed for listings of retail and service establishments in the study area. However, these business directories tend to include only larger centers and enterprises with more than one employee, thereby excluding owner-operated facilities and small service centers. A comparison of these sources for the primary central place, Medicine Hat, revealed wide variations in the number of listings contained in each source. Scott's Directories (1990/91) listed 68 facilities, while the Canadian Trade Index (1990) contained 32, Henderson's listed 893 in 1990, and Dun and Bradstreet (1990), 30. This compares to the more than 1000 individual business listings found in the 1990 telephone directory.

As well, business directories do not list many of the recreational, professional, and service facilities located in the central places. Their focus is more strictly applied

to retail establishments or large scale industries. No schools, community halls, curling rinks, or arenas are included, although these facilities do fulfill an important social and recreational role in small urban centers, and draw the hinterland population to the center (Downey, 1965, p. 49). Additionally, franchise outlets are often included under the owner's address, which, in many cases, is the address for the head office located in a major urban center. Although the actual franchise may be located in a small service center, no record of its location will be shown in the business directories.

This study assumes that all retail and service functions had telephone service throughout the study period. Although this may not be precisely true, it is likely that the majority of establishments would have had a telephone listing if they were to maintain a minimal level of accessibility with their suppliers and customers.

Secondary Directories: Sources other than telephone directories are consulted when the alternative source is considered more accurate. Canadian Grain Commission Listings are a more reliable source for the number of elevators in each service center, and the Canadian Post Office Listings were consulted to obtain information on the number and location of post offices. The South East Regional Planning Commission Report (1987) on the provision

of community service functions verified the number of community halls and recreation facilities in service centers in Southern Alberta. Alberta and Saskatchewan Liquor Control Board Annual Reports provided an accurate listing of liquor vendors and their year of establishment. Finally, school records for the school districts in the study area were examined for listings on closures and consolidations. These secondary sources reduce the number of potential omissions in the final compilation of retail and service functions.

Local Histories: Although published local histories are available for less than half of the central places in the study area, and given that the histories are of varying quality and applicability to this thesis, a great deal of information can be gleaned from the materials researched for the histories. Historic photographs of the "main street" and original town plans are often contained in these documents and offer relevant historical information. Several of the publications consulted provided merchant lists or business district histories, which could be correlated with the listings provided in telephone directories. Coverage of natural catastrophes such as fires provided listings of establishments lost or rebuilt. If relevant to the center, the documents may also note the

construction or demolition of a specific retail or service facility.

As the histories are not intended as a source of information on trade functions, some interpretation of the information is required. However, they do allow some verification of information and are a source of residents' opinions on community life and on service center growth and decline.

Field Study: The field study consisted of an on-site survey of service centers and their respective functions. The listings contained in current directory sources were verified, and improved on by recording any functions omitted in the listings. The probability of inaccurate listings of retail and service facilities is highest for the very small centers, as retailers may chose to be included in the directory listings for a nearby larger center to increase their potential market, or the telephone service may be such that the entire small center is included in the listings for the larger center.

In addition to a visual survey, interviews were conducted with retailers, where available, to confirm the number and types of functions presently available and ascertain any inaccuracies in the listings for previous years. The respondents provided information on demographic, economic, social, and retailing conditions in the central

places and their hinterlands. This further increases the validity of the sources used to compile the lists of functions.

Understandably, knowledgeable retailers were not available in every center in the study area. Verification of historic information was also difficult, as the individuals consulted could not recall every change in the retail landscape over the past forty years. However, the conjectures made by interview respondents on the reasons for change in the settlement system provided an alternative perspective from a source directly involved in and influenced by these changes. A summary of these interviews is contained in Appendix A.

It cannot be said that this information represents an absolutely comprehensive overview of all facilities available in all places from 1950 to the present. However, these sources do provide an acceptable, reasonably complete and reliable compilation of retail and service functions in the study area. The listing of retail and service functions is shown in Appendix B, a listing of the functional score of each center is contained in Appendix C, and the position of each center by functional score relative to other centers in the settlement system is shown in Appendix D.

Relative Location and Transportation Changes

Substantial improvements in the surface conditions of local and provincial highways have eased the physical and social isolation of rural residents (Fuguitt, 1963, p. 259). The 1960's and 1970's were decades of substantial road improvement in the Medicine Hat area. The highways from Medicine Hat to Calgary, Lethbridge, and Maple Creek were all hard surfaced and improved during these decades. Although this benefits residents, Hart and Salisbury credit the automobile with encouraging the "economic leukemia" of small service centers, as the automobile allowed rural residents travel to centers other than the nearest center to satisfy their consumer needs (1963, p. 159).

Although reliable information on changes in road surfaces is available, data on travel times on highways is limited. Alberta Transportation has a number of sources which document changes in road conditions, but little information on reduced temporal distances consequent to modern technology. Unpublished records from Alberta Transportation on the speed of travel on different classes of roads are available, and are used to estimate changes in travel time between service centers since 1950. These values approximate travel time. These "spot speed" records, discussed in Chapter Five, record vehicular movement at or near maximum allowable speed limits under ideal travel

conditions, so it is likely travel speed is overestimated. However, the information does show that travel time has decreased substantially since 1950.

Overall speeds have increased on all but the poorest quality road surfaces since 1950. Provincial road maps are used to determine the distance between centers; both the lowest mileage distance and the highest quality road surface available to the consumer are used to determine travel speeds.

DATA CONSTRAINTS

The focus in this section is on the qualifications that should be applied to the information obtained from telephone directories, as they are the primary source of data in this study.

Levels of Trade: The level of patronage of a particular facility cannot be determined through the examination of business listings. Nor is it possible to determine the level of use of a community facility or public service center. Some subjective indications of use may be obtained through the field study but trade volumes are not estimated in the sources considered. This study will accept that the presence of a function indicates a viable level of patronage, even though the possibility exists of a time lag between the loss of a viable level of trade and closure of

the establishment. The number of establishments in this situation would likely be small in any test year and should not significantly affect the results of this study.

Underestimation of the Number of Facilities: A second constraint is the under-recording of functions. Functions can be excluded for a number of reasons. First, ambiguous entries cannot be classified in the trade listings. "Ray-tech Enterprises", for example, was established in Brooks between 1960 and 1970. The function was no longer listed in 1980. As it could not be classified and the company representative could not be contacted for an explanation of its type of service, the entry was not included in the trade listings. Second, functions may operate without a business listing. For example, a self-employed tailor operating from a private home may not be included in any directory. These functions are not included in the cumulative total of facilities in a service center. However, most facilities are listed by relatively self-explanatory names, and the number of home services is likely to be small enough so as to not sufficiently affect the results. The exclusion of the few less easily classified functions should not substantially alter the findings of this study.

It was assumed that these constraints did not significantly undermine the reliability of the combined sources. It was expected that the sources considered

adequately represented the functional content of each central place, and that the presence of a function was a suitable proxy for the patronage of these functions.

SUMMARY

This chapter has presented the sources and methods used in this study. The settlement system has been established as the system centered on Medicine Hat. The time period under investigation has been specified as 1950 to 1990. Data sources and data constraints reviewed consider the applicability of the information to the objectives of this thesis. This information provides the framework for the analysis which follows in Chapter Five.

CHAPTER V

EXPLANATION OF THE REORGANIZATION OF THE SYSTEM

INTRODUCTION

This chapter describes and analyses the reorganization undergone by the central place system of Medicine Hat. Briefly, change is considered at three levels. First, the form of the settlement system is established. Following this, alterations to the status over the time period under consideration are measured, using the functional score of each service center. Third, the relationship of growing and declining centers to improvements in the road network and road surfaces is analyzed. Data relating to the functional score of the service centers were assembled for each of the test years- 1950, 1960, 1970, 1980, and 1990. Comparisons are made both between decadal time periods and across the time frame. The analysis is designed to test the hypotheses by providing evidence for the centralization of the of goods and services to fewer, larger centers by the process of initial advantage and the benefit of relative location.

CHANGE IN THE SETTLEMENT SYSTEM

The status of each service center is measured by the functional score of the center. The distribution of functional scores for each of the test years determines the hierarchy of trade centers. Functional coefficients are obtained for each service center by the method described in Chapter Four. The functional units considered, their location by central place, and the number of occurrences of each function are listed in Appendix B. Functional scores for each center are shown in Appendix C. Summaries of this information are shown on Tables 5.1 and 5.2.

The hierarchy is defined by examining the distribution of functional scores for natural breaks. The break points will be tested to confirm that the functional scores of centers on that level of the hierarchy are closer in absolute number to the scores of other places within that level than to the functional scores of members on any other level. This distribution is illustrated in Table 5.3. Clear breaks in 1950 divide the dispersion into five levels. The separation of the hierarchy into five levels is less pronounced in subsequent years, but a tendency of the array of centers to cluster within these five groups prevails across the time frame considered. In instances where the level of a particular service center in the hierarchy is not

Table 5.1 Number of Functions per Service Center

	1950	1960	1970	1980	1990
Bindloss	10	7	11	12	11
Bow Island	29	62	81	90	89
Brooks	82	108	174	352	362
Buffalo	5	2	2	3	4
Burstall	18	16	20	24	22
Consul	11	9	9	14	13
Dunmore	3	6	4	5	8
Elkwater	8	4	6	8	11
Empress	23	22	19	16	15
Etzikom	5	9	8	9	8
Golden Prairie	4	17	8	6	7
Hays	9	5	4	5	6
Hilda	10	14	15	11	9
Iddesleigh	2	3	3	3	3
Irvine	15	18	13	11	12
Jenner	2	2	6	7	6
Leibenthal	0	2	4	6	2
Maple Creek	76	103	117	131	124
Manyberries	8	5	4	22	13
Medicine Hat	306	584	536	824	1064
Mendham	7	14	11	8	5
Millicent	1	2	2	1	1
Onefour	1	0	0	0	0
Orion	3	5	6	5	4
Patricia	3	5	5	7	5
Piapot	14	13	9	8	10
Rainier	7	5	4	7	7
Ralston	1	10	12	8	9
Ravenscrag	4	4	7	5	1
Redcliff	27	28	71	96	125
Retlaw	14	2	2	6	0
Richmond	5	17	15	11	12
Robsart	7	7	8	5	5
Rolling Hills	3	6	6	6	7
Scandia	6	8	7	5	8
Schuler	7	10	8	8	7
Seven Persons	1	3	4	3	4
Suffield	1	2	2	5	5
Tilley	18	22	15	12	19
Walsh	3	3	3	4	6
Total	**759**	**1164**	**1241**	**1769**	**2029**

Table 5.2 Service Center Functional Score

	1950	1960	1970	1980	1990
Bindloss	28.2	11.9	39.9	27.5	32.5
Bow Island	107.2	193.5	306.1	245.2	236.3
Brooks	640.1	445.6	663.1	822.0	768.2
Buffalo	69.5	3.7	3.1	4.5	8.2
Burstall	56.0	31.5	45.0	51.6	43.0
Consul	59.5	26.4	29.3	52.9	24.6
Dunmore	3.7	11.1	6.7	8.8	14.7
Elkwater	99.8	55.4	28.5	31.7	48.6
Empress	100.8	57.7	52.7	49.0	50.4
Etzikom	8.9	14.3	17.5	24.1	24.2
Golden Prairie	4.9	31.3	12.7	12.5	15.7
Hays	33.9	7.7	7.2	7.9	12.5
Hilda	22.5	25.4	22.0	15.0	21.4
Iddesleigh	2.4	4.2	5.3	5.7	7.9
Irvine	41.0	37.9	18.5	15.7	26.5
Jenner	2.4	1.9	18.0	16.3	8.7
Leibenthal	0.0	3.2	7.7	12.1	5.1
Maple Creek	509.9	472.0	415.9	382.4	293.9
Manyberries	34.7	18.8	5.0	37.1	21.4
Medicine Hat	2505.8	2603.2	2153.9	2341.7	2393.0
Mendham	12.9	22.3	18.3	13.0	12.8
Millicent	1.2	3.4	4.5	3.6	2.9
Onefour	4.0	0.0	0.0	0.0	0.0
Orion	6.4	7.0	9.7	8.8	7.1
Patricia	8.0	8.6	8.9	11.9	9.8
Piapot	57.1	19.5	14.6	15.0	20.5
Rainier	28.1	10.7	12.7	19.3	18.9
Ralston	4.0	43.0	36.9	24.7	32.5
Ravenscrag	12.9	5.9	16.7	7.3	1.9
Redcliff	241.2	87.5	184.7	227.5	250.7
Retlaw	57.6	2.2	2.3	18.7	0.0
Richmond	8.9	32.9	26.9	17.6	27.0
Robsart	14.9	11.0	14.2	8.5	20.4
Rolling Hills	10.8	10.5	9.8	11.5	24.2
Scandia	13.7	11.6	12.2	6.6	18.5
Schuler	12.9	17.5	13.0	13.5	14.3
Seven Persons	1.2	4.6	11.9	12.1	14.3
Suffield	1.3	3.5	2.8	23.8	15.3
Tilley	68.3	41.3	38.5	29.8	41.2
Walsh	3.6	3.2	3.4	7.7	8.1
Total	**4900.2**	**4402.9**	**4300.1**	**4644.6**	**4597.2**

Table 5.3 Hierarchy of Service Centers by Functional Score, 1950-90

	1950		1960		1970		1980		1990	
	center	score	center	score	center	score	center	score	center	score
	Medicine Hat	2505.8	Medicine Hat	2603.2	Medicine Hat	2153.9	Medicine Hat	2341.7	Medicine Hat	2393.0
Level 1 Total		2505.8		2603.2		2153.9		2341.7		2393.0
midpoint score										
	Brooks	640.1	Maple Creek	472.0	Brooks	663.1	Brooks	822.0	Brooks	768.2
	Maple Creek	509.9	Brooks	445.6	Maple Creek	415.9				
Level 2 Total		1150.0		917.6		1079.0		822.0		768.2
midpoint score		575.0		458.8		539.5				
	Redcliff	241.2	Bow Island	193.5	Bow Island	306.1	Maple Creek	382.4	Maple Creek	293.9
	Bow Island	107.2			Redcliff	184.7	Bow Island	245.2	Redcliff	250.7
	Empress	100.8					Redcliff	227.5	Bow Island	236.3
	Elkwater	99.8								
Level 3 Total		549.0		193.5		490.8				
midpoint score		104.0				245.4		227.5		236.3
	Buffalo	69.5	Redcliff	87.5	Empress	52.7	Consul	52.9	Empress	50.4
	Tilley	68.3	Empress	57.7	Burstall	45.0	Burstall	51.6	Elkwater	48.6
	Consul	59.5	Elkwater	55.4	Bindloss	39.9	Empress	49.0	Burstall	43.0
	Retlaw	57.6	Ralston	43.0	Tilley	38.5	Manyberries	37.1	Tilley	41.2
	Piapot	57.1	Tilley	41.3	Ralston	36.9	Elkwater	31.7	Bindloss	32.5
	Burstall	56.0	Irvine	37.9	Consul	29.3	Tilley	29.8	Ralston	32.5
	Irvine	41.0	Richmond	32.7	Elkwater	28.5	Bindloss	27.5	Richmond	27.0
	Manyberries	34.7	Burstall	31.5	Richmond	26.9	Ralston	24.7	Irvine	26.5
	Hays	33.9	Golden Prairie	31.3	Hilda	22.0	Etzikom	24.1	Consul	24.6
	Bindloss	28.2	Consul	26.4	Irvine	18.5	Suffield	23.8	Rolling Hills	24.2
	Rainier	28.1	Hilda	25.4	Mendham	18.3	Rainier	19.3	Etzikom	24.2
	Hilda	22.5	Mendham	22.3	Jenner	18.0	Retlaw	18.7	Manyberries	21.4

				Plapot	19.5	Etzikom	17.5	Richmond	18.7	Hilda	21.4
				Manyberries	18.8	Ravenscrag	16.7	Jenner	16.3	Plapot	20.5
				Schuler	17.5			Irvine	15.7	Robsart	20.4
								Plapot	15.0	Rainier	18.9
								Hilda	15.0	Scandia	18.5
										Golden Prairie	15.7
										Suffield	15.3
Level 4 Total		556.4			548.2		408.7		470.9		526.8
midpoint score		41.0			31.5		27.7		24.1		24.2
	Robsart	14.9	Etzikom	14.3	Plapot	14.6	Schuler	13.5	Dunmore	14.7	
	Scandia	13.7	Bindloss	11.9	Robsart	14.2	Mendham	13.0	Schuler	14.3	
	Mendham	12.9	Scandia	11.6	Schuler	13.0	Golden Prairie	12.5	Seven Persons	14.3	
	Schuler	12.9	Dunmore	11.1	Golden Prairie	12.7	Seven Persons	12.1	Mendham	12.8	
	Ravenscrag	12.9	Robsart	11.0	Rainier	12.7	Leibenthal	12.1	Hays	12.5	
	Rolling Hills	10.8	Rainier	10.7	Scandia	12.2	Patricia	11.9	Patricia	9.8	
	Richmond	8.9	Rolling Hills	10.5	Seven Persons	11.9	Rolling Hills	11.5	Jenner	8.7	
	Etzikom	8.9	Patricia	8.6	Rolling Hills	9.8	Orion	8.8	Buffalo	8.2	
	Patricia	8.0	Hays	7.7	Orion	9.7	Dunmore	8.8	Walsh	8.1	
	Orion	6.4	Orion	7.0	Patricia	8.9	Robsart	8.5	Iddesleigh	7.9	
	Golden Prairie	4.9	Ravenscrag	5.9	Leibenthal	7.7	Hays	7.6	Orion	7.1	
	Onefour	4.0	Seven Persons	4.6	Hays	7.2	Walsh	7.7	Leibenthal	5.1	
	Ralston	4.0	Iddesleigh	4.2	Dunmore	6.7	Ravenscrag	7.3	Millicent	2.9	
	Dunmore	3.7	Buffalo	3.7	Iddesleigh	5.3	Scandia	6.6	Ravenscrag	1.9	
	Walsh	3.6	Suffield	3.5	Manyberries	5.0	Iddesleigh	5.7	Retlaw	0.0	
	Iddesleigh	2.4	Millicent	3.4	Millicent	4.5	Buffalo	4.5	Onefour	0.0	
	Jenner	2.4	Walsh	3.2	Walsh	3.4	Millicent	3.6			
	Suffield	1.3	Leibenthal	3.2	Buffalo	3.1	Onefour	0.0			
	Millicent	1.2	Retlaw	2.2	Suffield	2.8					
	Seven Persons	1.2	Jenner	1.9	Retlaw	2.3					
	Leibenthal	0.0	Onefour	0.0	Onefour	0.0					
Level 5 Total		139.0		140.2		167.7		155.7		128.3	
midpoint score		4.45		5.3		7.5		7.6		8.1	

clearly identifiable or falls between levels in the hierarchy, the range of functions in the service center was examined to determine if the center more closely relates to centers in the higher or lower level.

It is evident from these arrays that the hierarchy has not been altered to the degree expected in the hypotheses. Entire levels of the hierarchy have not been subsumed by higher order centers, and the lowest order centers have not fallen off the hierarchy. Instead, the levels in the hierarchy have remained relatively stable.

Medicine Hat remains at the apex of the hierarchy for each of the study years, clearly distinct from the second order centers. Distinct first, second and third level breaks in the distributions are consistent over the time frame considered. Less defined and less consistent separations exist between the fourth and fifth order centers, the hamlets and villages in the study area. The separation of level four from level five varies across the arrays, but not as significantly as would be expected. Overall, the five levels of the hierarchy defined in 1950 occur in the four subsequent time periods.

The similarity of the distributions for 1950 and 1990 and within the intervening time period suggests that the number of levels in the hierarchy has neither altered nor has the proportional distribution of centers within the each

level of the hierarchy changed significantly. When centers are mapped by change in position in the hierarchy (by level, comparing 1950 to 1990) on Maps 6 to 10, it is evident that there has not been a great deal of movement of service centers among levels in the hierarchy. There were no fewer levels in 1950 than in 1990.

MOVEMENT OF CENTERS AMONG LEVELS IN THE HIERARCHY

Although the macro number of levels in the settlement system has remained stable, on a more micro level, there have been variations in the movement of individual centers within the five levels over the forty years under investigation. Maple Creek, declined from level two to level three in 1990. Redcliff, a third order center in 1950, declined to the fourth level in 1970 then back to the third level in 1980 and 1990. Empress, as well, declined in status, falling from level three in 1950 to level four for the remaining test years. Hays, Bindloss, and Rainier declined in status as well, from level four to five in 1950. Bindloss regained level four status in 1970; Rainier in 1980. A few fifth order centers experienced growth and decline, as shown in Table 5.3.

It is expected that service centers scoring lowest for each level in the settlement hierarchy would be the first to decline to a lower level of the hierarchy. In all cases,

except Redcliff and Buffalo, those centers which declined had a lower functional score than the midpoint score for that level in the hierarchy. When fifth order centers with a 1950 functional score of less than the midpoint are considered, five declined slightly or stagnated, eight actually increased their individual functional score. They remained, however, below the midpoint score of the level in subsequent test years. This variation in status for the "increasing score" centers is a result of a higher functional score for certain goods and services in the retail hierarchy. As the score for a good or service increases, the functional score for the center increases. Particular functions increase in "value" as they occur less frequently in the retail landscape. Grain elevators, for example, have declined in number across the time span, and are centralizing to higher order centers. A fifth order center that still contains an elevator would increase in functional score.

When below midpoint 1950 level four centers are examined, the functional score of Bindloss remained stable over the later test years, after a decline and recovery in 1960 and 1970, respectively. Hays and Rainer declined from level four to level five, from villages to hamlets. The midpoint score of the level in aggregate also declined.

This is likely due to the villages losing functions and custom to the small towns, larger towns, and the city.

For third order centers, the midpoint increased across the time frame considered. It is likely that this level most strongly benefited from the relative decline of villages in the settlement system. The functional score of Empress declined substantially from the third to the fourth by 1960, losing half its 1950 functional score by 1990. Redcliff declined to level four in 1960, then regained its small town status by 1990. Bow Island remained at level three in all test years and increased in functional score relative to the other third order centers.

For second order centers, Maple Creek declined from level four to level three in 1970, and has continued to lose status. Brooks increased its functional score over the time frame considered, and is the highest status center in the settlement system excluding Medicine Hat. Medicine Hat continues its dominance over the hierarchy, although the functional score has remained stable over the study years. As the apex of the hierarchy, it has always contained the highest order goods and services. As some services decline in functional score and others increase, the city's score remains relatively stable. Virtually all the goods and services available in the study area, excluding the general

store, are available in the city. Appendix D illustrates the functions available by level in the hierarchy.

Decline, then, is most prevalent at the `village' level of the hierarchy, the fourth order of the dispersion. It may be that hamlets have stagnated to such a degree that further decline will only occur when the one or two remaining functions cease to operate. The hamlets and villages losing functions will no longer operate as service centers when functional decline is completed. The fifth and fourth orders together represent the majority of declining centers. As residents of these small centers and their surrounding hinterlands bypass the small center to obtain low order and higher order goods in the small towns, larger towns, and the city of Medicine Hat, the smallest centers will lose their toehold on the settlement hierarchy and will cease to function as service centers.

This decline is more clearly illustrated when the dispersion of functional scores at each level is considered. As shown in Table 5.4, the first and second orders of the hierarchy are attracting an increasingly larger share of the total functional score than the three lowest orders. The two highest orders are the foci of centralization for functions across the time frame.

Table 5.4 Dispersion of Functional Scores

	levels 5,4,3, (hamlets, villages, towns)	%	levels 2,1 (greater towns, city)	%
1950 score	1244.4	34.0	3655.8	66.0
1960 score	881.9	25.0	3520.8	75.0
1970 score	1067.2	33.0	3232.9	67.0
1980 score	854.1	27.0	3167.3	73.0
1990 score	891.4	28.2	3161.2	71.8

The above table points to the conclusion that the settlement system has not been as stable over time as change in the number of levels in the system would indicate. In the Medicine Hat region, the pattern appears to be one of stagnation at the lowest level of the hierarchy. Growth is, in almost all cases, assured once the service center reaches the third, second and first orders. The smallest centers, however, will either stagnate until current operations cease to function or economic trends reverse and promote the unlikely revitalization of small towns.

There has not been a corresponding trend toward hierarchical simplification as small and below median centers decline. Hodge (1965) and Stabler (1973) predicted that the form of the central place system would simplify over time, with growth at the extremes of the hierarchy and the decline of service centers in the middle levels of the hierarchy. This does not correspond with the pattern of

change in the hierarchy considered in this study area. Instead, centers in the lowest levels of the hierarchy are least likely to grow and more prone to decline than centers at the third, second and first levels of the hierarchy. This is likely due to the relative strength of the higher order centers. Apparently, once a center achieves a certain threshold, growth, or at least maintenance, appears to be assured.

CHANGE IN THE DISTRIBUTION OF FUNCTIONS

Central Place Theory hypotheses that service centers at each level will supply a certain bundle of goods and services to consumers. This bundle is specific to that level of the hierarchy. The bundle will be duplicated in centers of all succeedingly higher orders. Each succeeding order will, as well, contain a distinct bundle of functions not offered at previous levels of the hierarchy (Christaller, 1966, p. 19). Although it is unlikely that this theoretically perfect hierarchy would be recreated in a real world situation, the principle of successive inclusion of bundles of functions can be applied to the settlement system focused on Medicine Hat.

When the hierarchy is examined across the study years, no function was common to all centers for any of the five years for which data were assembled. It would be expected

that a low order function such as a gas station would be common to all service centers. This was not the case. However, if the theoretical pattern of successive inclusion is relaxed, a general pattern of bundles and inclusion can be observed.

Generally, each successively higher order of centers adds higher order goods and services to the retail landscape. Level five centers contain, at some time in the study period, between 17 per cent and 29 per cent of the all functions available to consumers. These functions, in all cases, are low order functions. General stores, post offices, and service stations are common at all levels of the hierarchy, and are assigned low functional scores. Appendix D illustrates an array of the total of all goods and services available to consumers, and suggests bundles unique to each level of the hierarchy for each test year.

Level five functions occur in nearly all fourth order centers for each year considered. The fourth order bundle also adds more specialized services, including auto sales, grocery stores, and hair stylists. Other functions represented in a minority of level five centers occur more frequently in fourth order centers.

Third order centers add services to the retail functions prevalent on levels four and five. Services in this order include doctors, veterinarians, and chiropractors. Level

two centers further increase the range of goods and services offered, adding additional professional services (dentist) and specialized retail services (jeweler), as well as the virtually ubiquitous representation of all other functions. Medicine Hat, as the first order, consistently offers all goods and services available in the lower orders. It is interesting to note that the general store, a function which occurred in almost every Prairie hamlet and town in the early part of the study period and still exists in several centers, is not represented in second or first order centers after 1960. This is likely because other retail establishments replaced the functions offered by the general store. Specialized boutiques and mega-stores provided more goods and services than a general store ever could.

Virtually all functions available in Medicine Hat can be obtained in second order centers. For each test year, levels two to five represent between 92 per cent and 98 per cent of the functions available in the trade area. Fifth, fourth and third order functions represented, on average, 80.6% of total functions available in the hierarchy. As noted previously, however, when status is conferred by the functional score of the center, first and second order centers attract a larger share of total status available in the hierarchy than the three lowest orders combined. The hierarchy is not as clearly defined as would be expected, as

the fifth order offers few functions not available elsewhere in the study area. However, a pattern of successive inclusion of generalized bundle of functions is typified by this distribution. As well, it may be that the classification of goods and services is not discrete enough to illustrate the specialized nature of goods and services available in the city. For example, the category of doctor is available throughout the hierarchy in different test years. However, if a specialized classification had been used (heart specialist, psychiatrist) it is likely that they would only have been located in Medicine Hat.

CHANGE WITHIN LEVELS OF THE HIERARCHY

Each level of the hierarchy offers a particular group of core functions. The actual distribution of functions within the hierarchy has remained largely stable over time, with more specialized functions being offered at successively higher orders of the hierarchy. Some functions, however, have shown a tendency to shift among levels. As the status of a function increases or declines, so does its functional score and the likelihood of it occurring at a different level in the hierarchy. Functions increasing in value will shift to higher orders in the hierarchy. Functions becoming more ubiquitous or less valuable to consumers will shift to lower orders in the hierarchy.

The function of implement dealer, as an example, has shifted to a higher order in the hierarchy across the time frame considered. The dealers centralized to higher order centers to maintain viable levels of trade, and the number of occurrences of the function declined. Rural customers now travel to higher order centers to obtain this service. Implement dealers are now found only in the two highest levels of the hierarchy.

Grain elevators, as well, have centralized to higher levels of the hierarchy. They have declined in absolute numbers in the study area. The remaining elevators have concentrated to higher order centers. This is true for all Prairie provinces. It is interesting to note that, overall, the total tonnes of grain handled by elevators in Alberta has not increased significantly from 1950 to 1990. Elevator capacity in the province has remained at approximately 3,000,000 tonnes each year. The number of elevators in the province, however, has decreased from a high of 1781 in 1933/34 to less than 600 in 1990/91. In the study area, the number of elevators has declined from 99 to 49 over the same time period (see Table 5.5). Although overall capacity in Alberta has remained unchanged, the closure of elevators has resulted in the loss of an important focus for small service centers.

Table 5.5 Grain Elevators in the Study Area

	# elevators 1949/50	# elevators 1958/59	# elevators 1969/70	# elevators 1979/80	# elevators 1989/90
Bindloss	3	3	2	3	1
Bow Island	5	7	7	5	3
Brooks	3	3	3	2	2
Buffalo	1	1	1	1	0
Burstall	5	5	5	2	1
Consul	1	1	1	1	1
Dunmore	2	0	0	0	1
Elkwater	0	0	0	0	0
Empress	4	4	2	2	1
Etzikom	3	4	3	3	2
Golden Prairie	4	4	4	4	2
Hays	0	1	1	1	1
Hilda	5	5	5	4	2
Iddesleigh	2	1	1	1	0
Irvine	5	5	5	3	1
Jenner	2	1	1	1	1
Leibenthal	0	0	0	0	0
Manyberries	2	1	1	1	0
Maple Creek	2	2	2	2	2
Medicine Hat	4	4	4	5	5
Mendham	5	5	5	5	5
Millicent	1	1	1	0	0
Nemiskam	3	3	3	3	1
Onefour	0	0	0	0	0
Orion	2	2	2	2	1
Piapot	5	5	3	1	1
Patricia	1	1	1	0	0
Rainier	1	1	1	0	0
Ralston	0	0	0	0	0
Ravenscrag	3	3	3	3	1
Redcliff	0	0	0	0	0
Retlaw	2	2	2	2	1
Richmond	4	4	4	4	3
Robsart	3	3	3	3	2
Rolling Hills	0	0	0	0	0
Scandia	2	2	2	2	0
Schuler	4	4	4	2	2
Seven Persons	1	1	1	1	1
Suffield	0	0	0	0	0
Tilley	3	3	3	2	1
Vauxhall	3	3	3	3	3
Walsh	3	3	3	3	1
Total	**99**	**98**	**92**	**77**	**49**
% of 1949/50	**100.0**	**99.0**	**92.9**	**77.8**	**49.5**

In addition, hardware stores, pool halls, and pharmacies, common in fourth order centers at the start of the study period, have shifted to the third order of the distribution. In all cases, the functional coefficient of these activities increased, as the functions became more 'valuable' relative to other functions available in the retail landscape.

While these functions occur less frequently, several functions have become increasingly more common. Hotels, schools, convenience stores, taxis, and liquor stores now appear in lower order centers. As their functional scores decreased, smaller population thresholds were needed to support the functions. It could also be that the function was altered to allow lower trade levels to maintain a level of viability. Schools in smaller centers, for example, have been artificially supported by the bussing of students from outside the normal trade area for the facility.

A third process altering the distributional hierarchy is the introduction of new functions and the obsolescence of functions. One blacksmith, for example, was listed in the data sources as operating in 1950. The function did not subsequently reappear after this test date. General stores have concentrated at lower orders of the hierarchy while declining in absolute numbers. In general, new functions first occur in the highest order of the hierarchy, where a

large population is available to the new function. If successful, functions then decentralize to lower order levels of the hierarchy. In the settlement system under investigation, photographic studios and department stores characterize this functional diffusion. This redistribution of goods and services can be observed in Appendix D.

The process of functional concentration in higher levels of the hierarchy and the reverse process of functional diffusion have most strongly benefited the first and second orders of the hierarchy. Level two centers contain virtually all of the functions available at the highest order. Many functions have diffused from level one to level two, but less frequently shift to even lower levels of the hierarchy. Functions becoming increasingly more specialized tend to shift to the highest orders of the settlement system. Third order centers have both gained higher order functions such as accountants, florists and theaters, and lost functions, namely pharmacies and pool halls.

In general, three patterns of change characterize the activity of functions within the hierarchy. First, functions traditionally found in lower orders of the hierarchy are centralizing to higher orders. Second, new functions, or those originally occurring at higher orders of the hierarchy, are diffusing to lower orders. Third, some functions are becoming obsolete and are no longer occur in

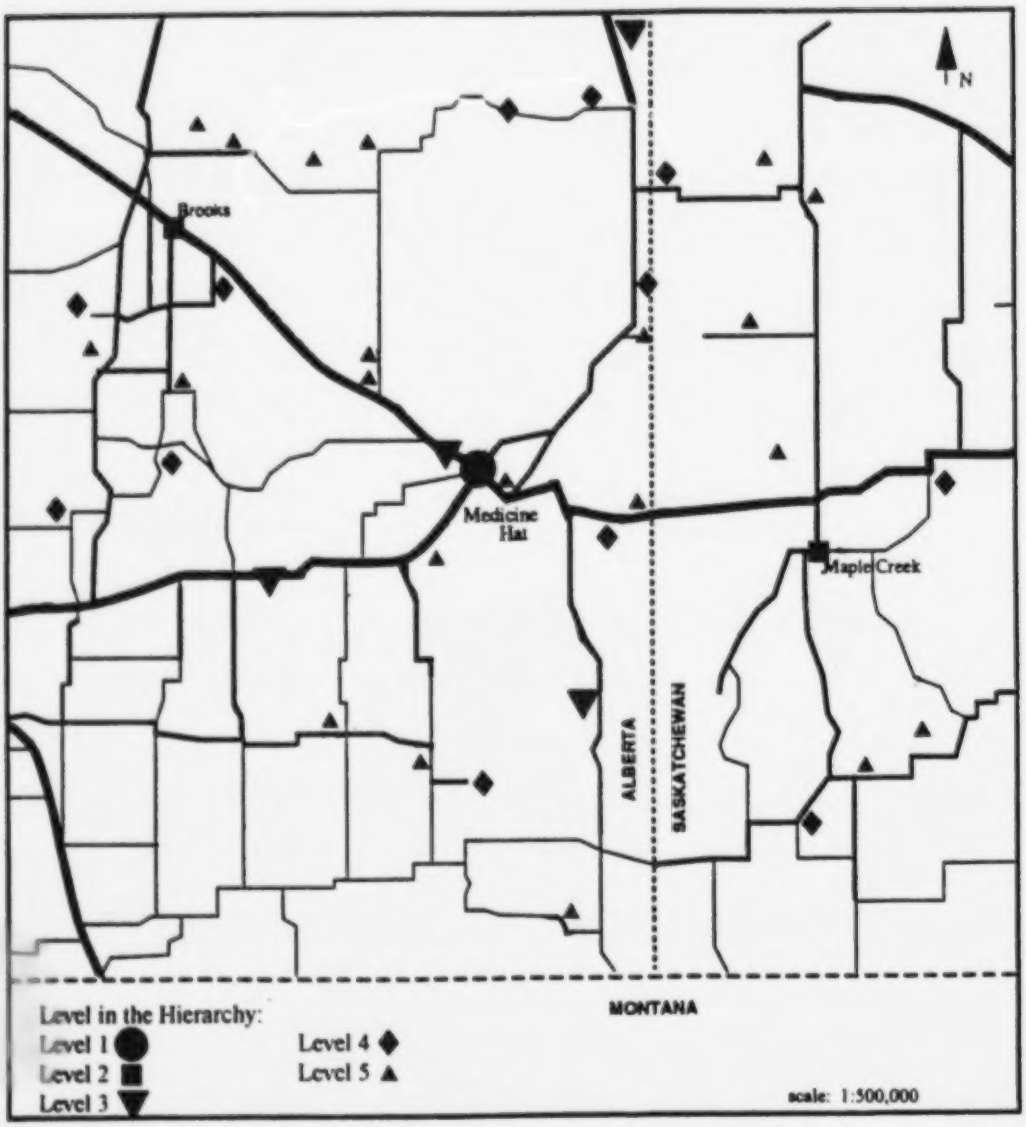
the hierarchy. All three patterns of change promote the centralization of retail and service functions to the highest levels in the hierarchy.

CHANGE IN THE SPACING AND DISTRIBUTION OF CENTERS

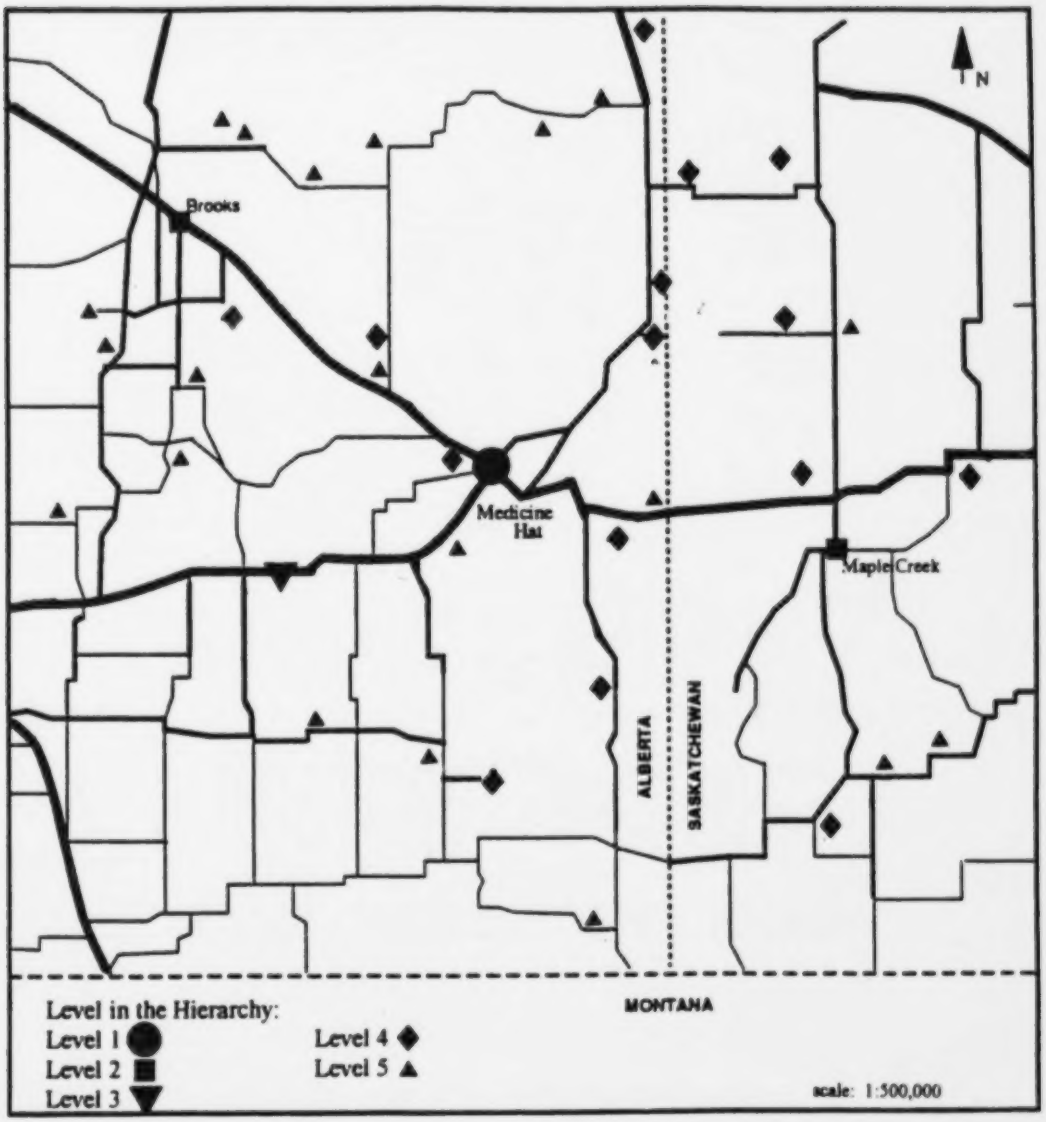
Central Place Theory hypothesizes that the form of settlement in a central place hierarchy will be an even, hierarchical distribution of centers of decreasing order surrounding a single highest order center. It is expected that the actual location of places in the trade area of Medicine Hat is far less "even" than a theoretical hierarchy would be, as the hierarchy is altered by topographic and anthropomorphic features. However, it anticipated that it would conform to the basic premises of Central Place Theory.

The distributional pattern of the settlement system most closely conforms to the expected pattern for the three highest orders of centers, although the arrangement must be considered in only the most generalized terms. The symmetry of the settlement pattern is skewed by several factors. First, the proximity of Redcliff to Medicine Hat; second, the decline from second to third order of Maple Creek; and third, the evolution of only one second order center when more would be theoretically expected. Maps 6 to 10 illustrate the central place hierarchy from 1950 and 1990.

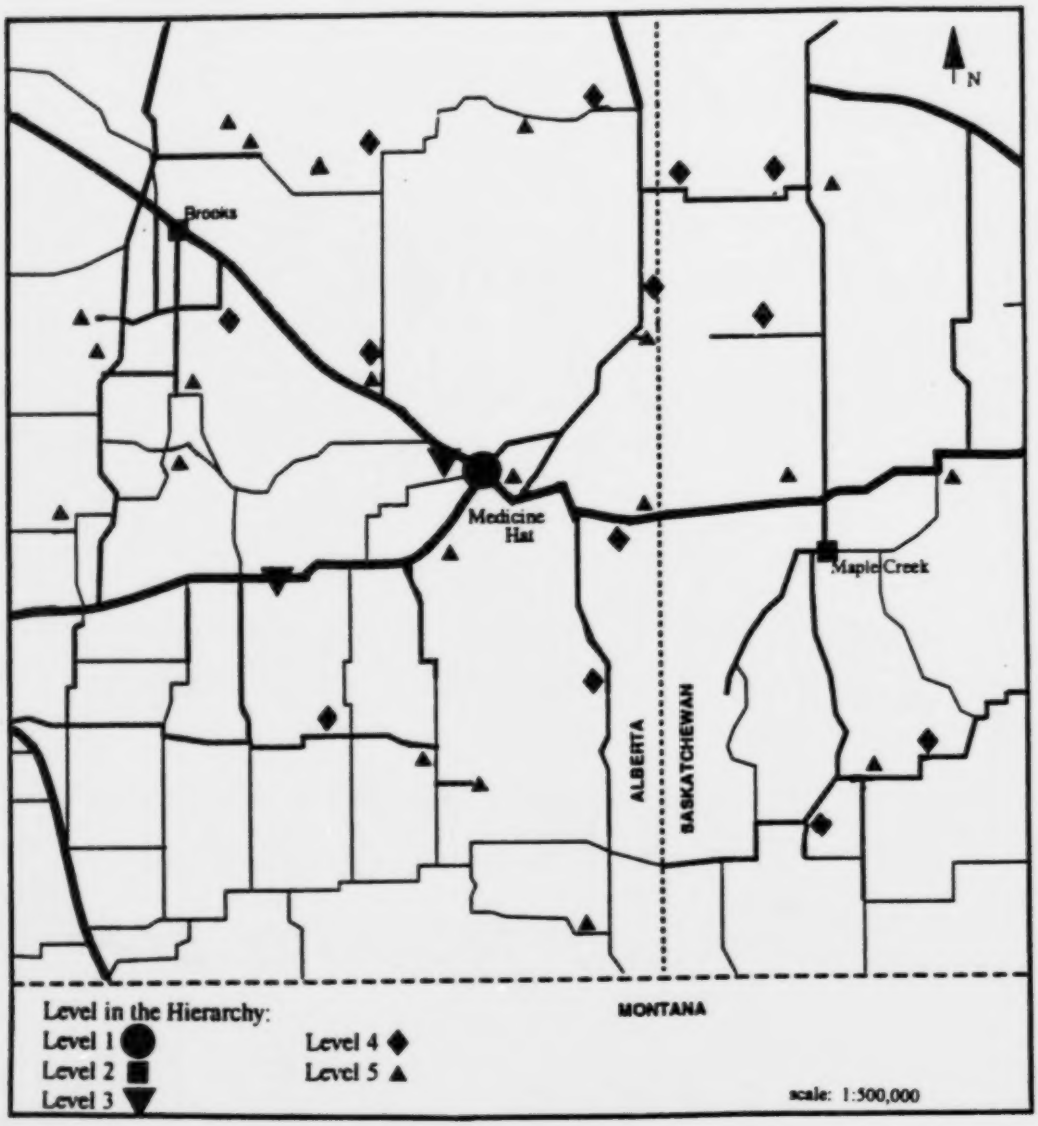
Map 6: Hierarchy of Service Centers, 1950



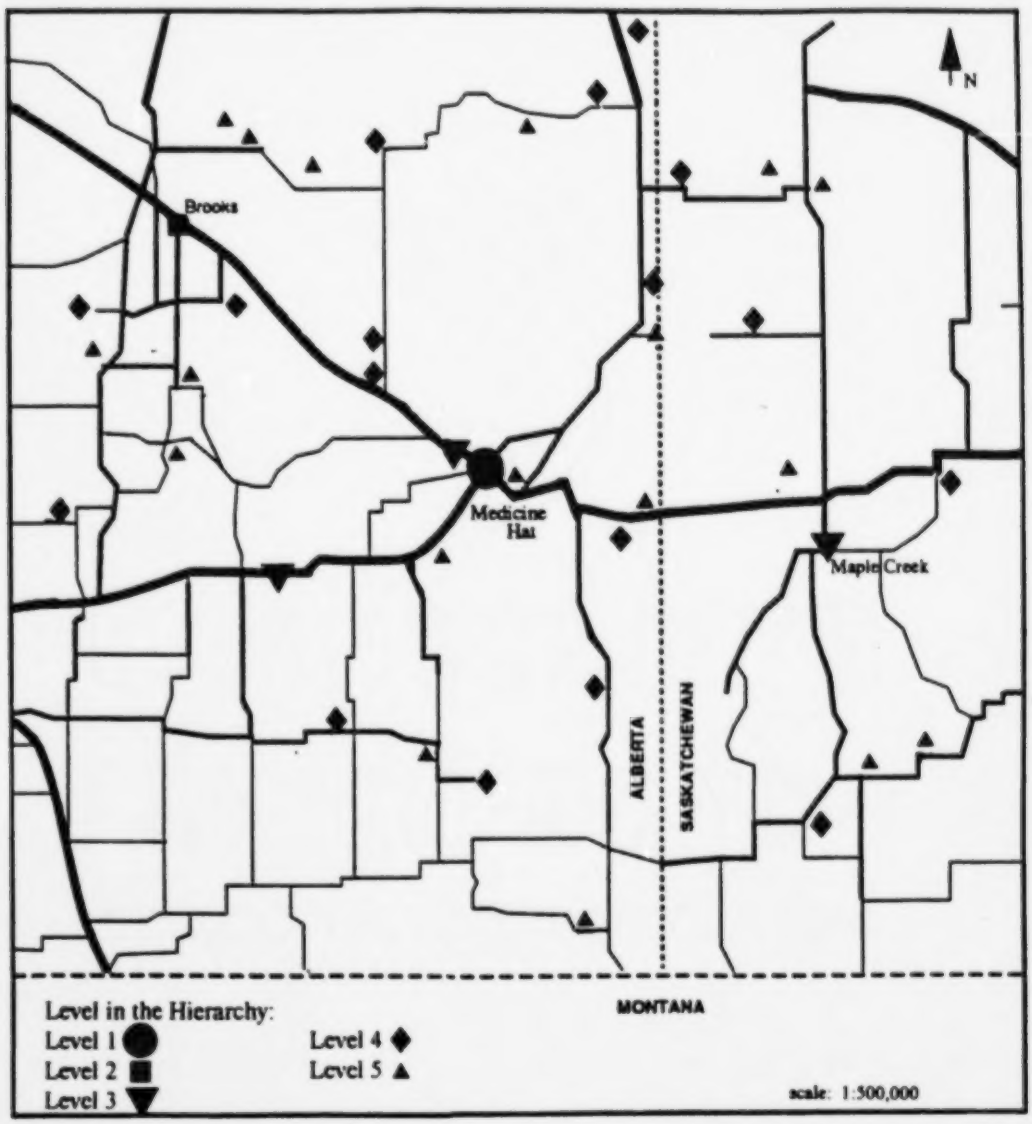
Map 7: Hierarchy of Service Centers, 1960



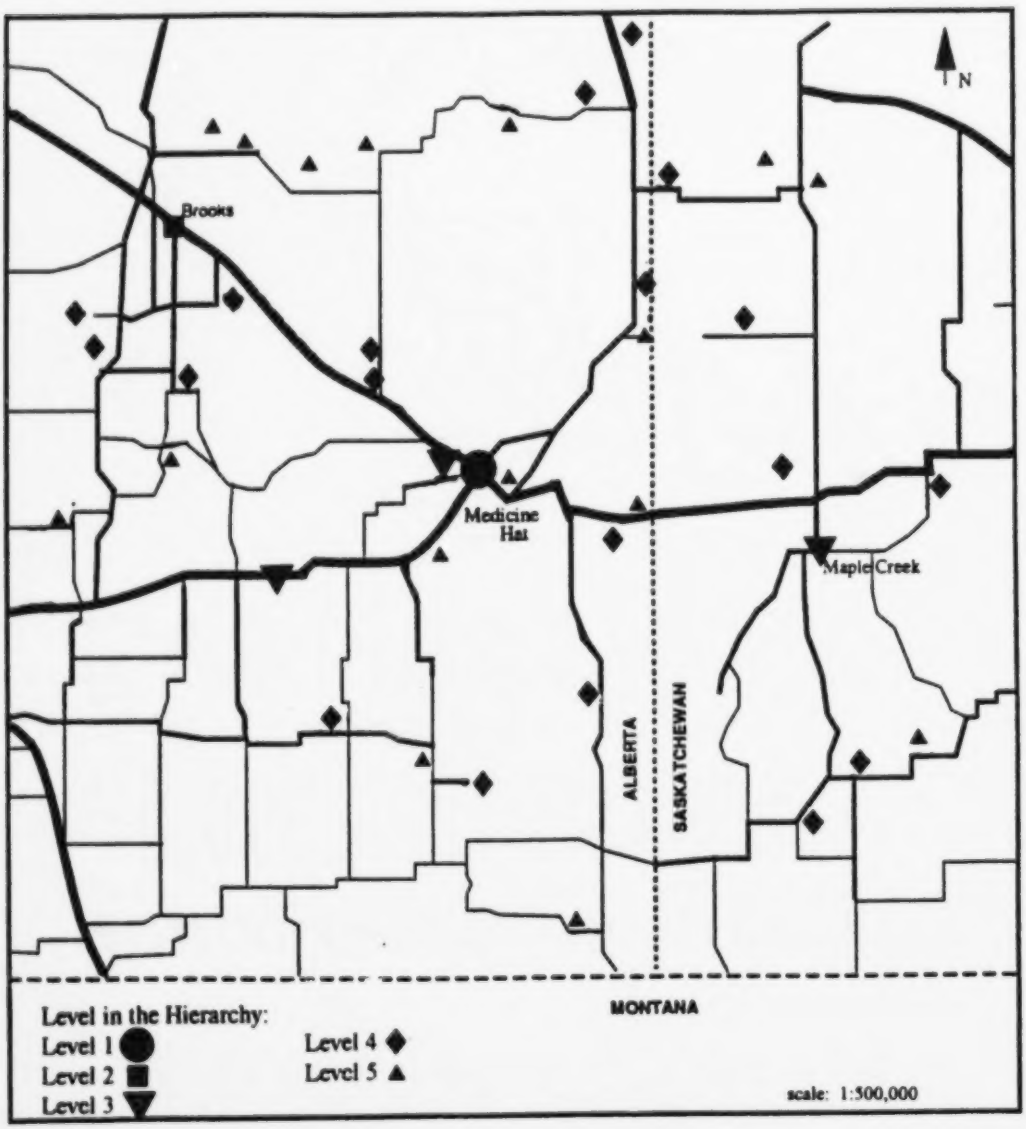
Map 8: Hierarchy of Service Centers, 1970



Map 9: Hierarchy of Service Centers, 1980



Map 10: Hierarchy of Service Centers, 1990



It is hypothesized that change in the hierarchy in this study is caused by the benefits of relative location and the initial functional array of the center. The former is in part a function of the distance to rival centers. The means of determining the distance between centers is complicated when the variable of time is introduced; travel time measured in minutes is more meaningful than mileage. That is, the actual line distance between centers A and B may be shorter than between B and C, but if road conditions allow for faster travel times between B and C the consumer in center B is more likely to travel to and patronize establishments in center C. Travel times have decreased with improvements in road conditions and to the automobile. The straight line distance or even the distance measured along existing roadways between centers is less important than the time it takes to travel between two centers. In this study, then, travel <u>time</u>, as estimated by highway speeds and road surface conditions, is the variable considered when examining change in the pattern of settlement. It is expected that centers in close proximity to Medicine Hat, connected by higher quality roadways, will lose custom to the highest order center. The smaller centers will decline, then cease to exist. The distance between centers will then increase as the system is reduced to a smaller number of larger centers.

To test for change, the distance between all service centers and Medicine Hat along existing roadways was measured, then road conditions at each of the test years was factored in to obtain a time distance (Table 5.6). Time distance was calculated by using Alberta Transportation figures for mean travel speeds by road quality. Their studies indicate travel speeds of 90km on four lane divided highways, 80km on paved roads, and 70km on gravel roads. Travel speeds on unimproved roads varies with road conditions, so an average speed of 50km was used in this study (Alberta Transportation, unpublished materials). The results are expected to show that those centers closest in time to Medicine Hat will be more likely to decline. Decline will be most profound in the lowest levels of the hierarchy. As well, the pattern of settlement should change as centers decline and shift among levels of the hierarchy.

The road network (as shown on Map 2) has largely been in place since the start of this time frame. It has been substantially improved since 1950 by road surface upgrading. In 1950, the only paved roadway in the study area linked Medicine Hat to Lethbridge, then continued east for a short distance, paving a portion of the TransCanada between Medicine Hat and the Alberta-Saskatchewan border. Since 1980, the TransCanada Highway through the study area has

Table 5.6: Time Distance to Medicine Hat

Center	Distance to Med Hat (km)	Level in Hierarchy 1950/1990	Road Quality 1950/1990*	Time Dist. (min) 1950/1990
Bindloss	122	4/4	G/P	104.5/91.5
Bow Island	58	3/3	P/P	13.5/43.5
Brooks	111	2/2	P/F	83.3/74.0
Buffalo	142	4/5	G/P	121.7/106.5
Burstall	115	4/4	G/P	98.6/86.3
Consul	154	4/4	G/P	132.0/115.5
Dunmore	16	5/5	P/F	12.0/10.6
Elkwater	66	3/4	G/P	56.6/49.5
Empress	125	3/4	G/P	107.1/93.7
Etzikom	96	5/4	G/P	82.3/72.0
Golden Pr.	89	5/4	G/P	76.3/66.7
Hays	72	4/5	G/P	61.7/54.0
Hilda	68	4/4	G/P	58.3/51.0
Iddesleigh	98	5/5	G/G	84.0/84.0
Irvine	37	4/4	P/F	27.8/24.6
Jenner	90	5/5	G/P	77.1/67.5
Leibenthal	160	5/5	G/P	137.1/120.0
Maple Creek	104	2/3	P/P	78.0/78.0
Manyberries	91	4/4	G/P	78.0/68.3
Mendham	172	5/5	G/G	147.4/147.4
Millicent	108	5/5	G/G	92.6/92.6

(Table 5.6 con't)

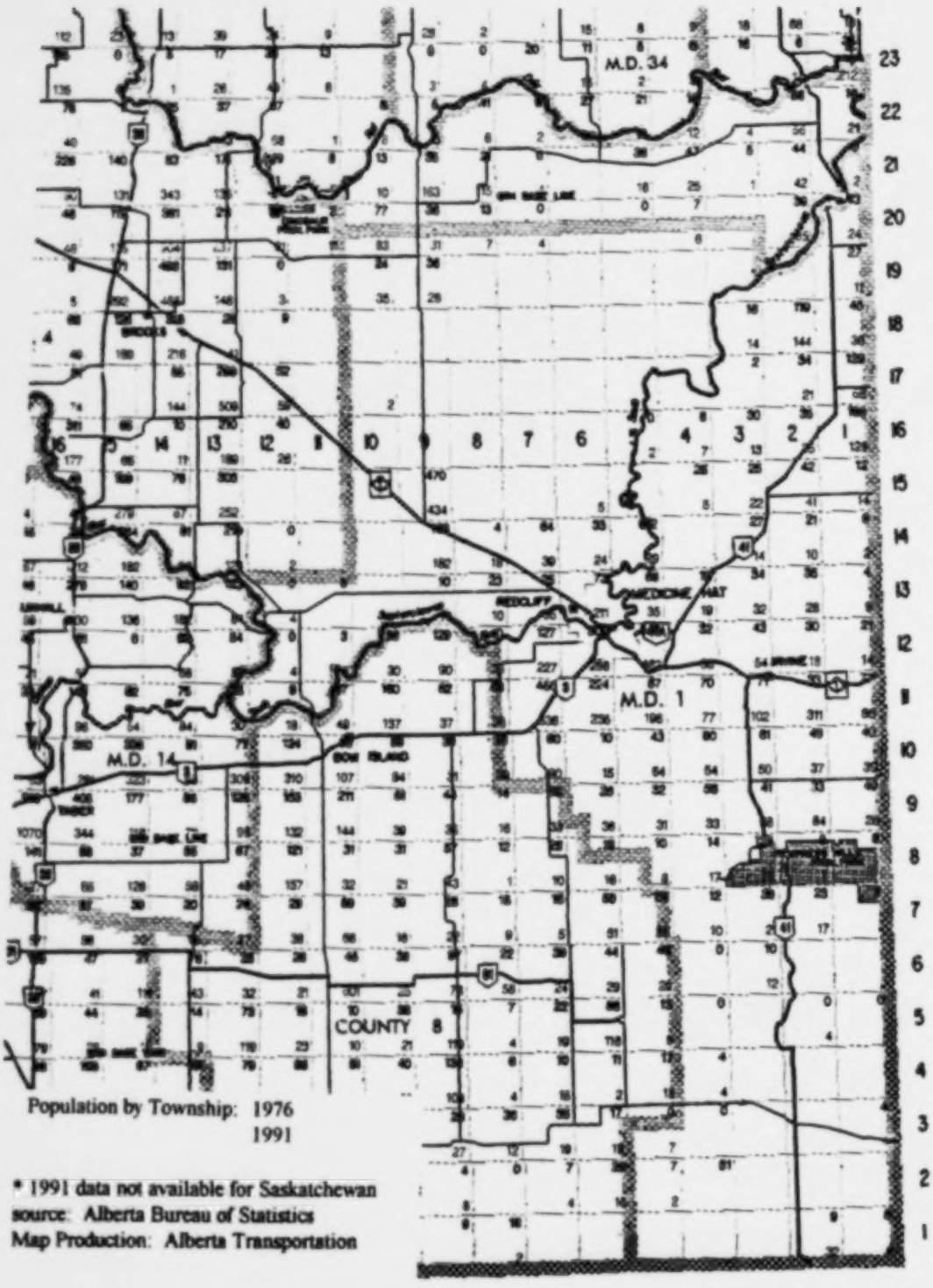
Center	Distance to Med Hat (km)	Level in Hierarchy 1950/1990	Road Quality 1950/1990*	Time Dist. (min) 1950/1990
Onefour	131	5/5	G/G	112.3/112.3
Orion	79	5/5	G/P	67.7/59.3
Patricia	110	5/5	G/P	94.3/82.5
Piapot	124	4/4	P/P	93.0/93.0
Rainier	150	4/4	G/P	128.6/112.5
Ralston	37	5/4	G/P	31.7/27.6
Ravenscrag	119	5/5	G/P	102.0/89.3
Redcliff	4	3/3	P/F	3.0/2.6
Retlaw	174	4/5	G/G	149.1/149.1
Richmond	88	5/4	G/P	75.4/66.0
Robsart	163	5/4	G/P	139.7/122.3
Rolling Hills	119	5/4	G/P	102.0/89.3
Scandia	161	5/4	G/P	138.0/120.8
Schuler	57	5/5	G/P	48.8/42.8
Seven Per.	24	5/5	P/P	18.0/18.0
Suffield	33	5/5	P/F	24.8/22.0
Tilley	87	4/4	P/F	65.3/58.0
Walsh	57	5/5	P/F	42.8/38.0

*f=four lane highway
p= paved roadway
g= gravel, earth, or oiled roadway

been upgraded in stages into a four lane divided highway. Other significant improvements are the paving of primary highways and secondary highways, and the improvement of many of the local roads. The remaining unimproved roads serve few rural travelers. Map 11 shows an overlay of the road system and compares the sparse rural population by township of 1991 to 1976.

Since 1950, improvements to the road network first have benefited larger centers. Transportation studies on route volumes indicate that the greatest demand exists between the largest centers, hence these portions of the road network are improved first. By 1960 all first and second order centers were connected by paved roads. These were in addition to the 40 per cent of fifth, fourth, and third order centers which were located on paved roadways. By 1970, all first, second, and third order centers were on paved roadways. Lower order centers located on paved roads early in the time span considered, were invariably located on direct links between larger centers. Later, in the 1980's, lower order centers benefited from a provincial government mandate to hard surface all access roads to urban centers, regardless of center size (Alberta Transportation). This scheduling of improvements, however, still reinforces the dominance of larger centers over smaller, less advantageously located centers.

Map 11: Rural Population Density by Township, 1976 and 1991, and Road Overlay, Alberta*



Population by Township: 1976
1991

* 1991 data not available for Saskatchewan
source: Alberta Bureau of Statistics
Map Production: Alberta Transportation

The relative location of small centers in relation to larger centers could be a benefit when road paving is considered. It is also likely that the bias of road improvements toward larger centers has altered the pattern of consumer movement. The concentration of higher order centers along improved transportation corridors is reinforced by the initial levels of functional provision and population. This legacy is later reflected in the upgrading of roads emanating outwards from higher order centers.

Residents in smaller centers located near improved roadways can more easily access larger centers. Accessibility increases with the level of the hierarchy; lower order centers do not decline in accessibility, rather they are perceived as less desirable as consumers focus on improved roadways as enablers to lead them to higher order goods and services. As well, consumers no longer need to access the smaller centers when larger centers are easily available to travelers.

It was expected that isolated centers, those more distant from Medicine Hat, would increase in functional score over the time period considered. Other centers located closer in time distance to Medicine Hat would decline.

The results obtained from this comparison did not wholly support the expected conclusion. Isolation from the major

rival center does not appear to increase the functional score of service centers. Low order isolated centers were no more likely to gain functional score than centers located closer to Medicine Hat. As a generalization, centers with declining functional scores, regardless of relative location, appear to be losing functions to the higher order centers.

Overall, time distance does not appear to be an accurate means of predicting the growth performance of service centers. It may be that improved travel speeds are less important to consumers than the accessibility of high order goods and services. Consumers may not be deterred by lengthy traveling times if the destination center will provide the level of servicing required to satisfy consumer needs. As well, location may be less important to the growth performance of a service center than the initial size of a center. As previously noted, larger centers with higher functional scores are more likely to grow; smaller centers with low functional scores are more likely to decline. This factor may contribute a greater influence to the growth performance of a center than its location relative to rival centers.

RELATIONSHIP BETWEEN FUNCTIONAL SCORE AND POPULATION

Linear regression shows the strength of the relationship between two variables by measuring the dependence of one variable on another. Regression analysis provides a means of predicting the relationship between two variables by fitting a line to a set of data.

In this study, regression analysis shows that the relationship between population and functional score is not perfect. That is, the functional score of a center is not a precise predictor of the population of the center. Appendix E illustrates the relationship between the two variables for each of the test years. Note that each test year is represented by two graphs, one for the city, greater towns and towns (levels 1 to 3) and one for the villages and hamlets (levels 4 and 5). This division was simply used to improve the readability of the data along the axis.

The 'best fit' line on the graphs clearly shows that, while there is some correlation between the variables, the relationship is not without wide variations for individual centers. Particularly for the smaller centers, the number of data points distant from the best fit line indicates that functional score, in this study, is not a predictor of population.

This is interesting as much of the research discussed in Chapter 2 uses population as a measure of service center

viability. If however, the primary purpose of a service center is to provide service, and if population and functional score do not correlate in a perfect relationship, then it follows that population may not adequately represent viability.

The residuals for the towns, greater towns, and the city of Medicine Hat are much smaller. At higher levels of the settlement hierarchy, where centers have a definite and established service role, the relationship between population and functional score is stronger.

The variation between the observed and predicted dependent values can be explained for many municipalities. Dunmore and Seven Persons, for example, are both centers with relatively large populations when their functional score is considered. Neither center provides many services to residents or their surrounding hinterland population. Both centers, however, continue to remain viable as population locales. Due to their location close to the city, services for these centers are provided by Medicine Hat.

The relationship between population and functional score is weak for Redcliff, as well. Although the center has grown by more than 2,000 residents, the functional score has remained relatively unchanged when 1950 is compared to 1990.

It is likely that the residents of Redcliff, too, patronize the services available in Medicine Hat.

In 1950, Ralston had an extremely low functional score for the population size of the center. This variation from a more 'normal' relationship results from the function of the center. Ralston serves the population and service locale for Canadian Forces Base Suffield. As the Base was still in its early development phase, it follows that the expected services had yet to be established. By 1990, the population of the center was a better fit to the functional score.

Linear regression assumes a causal relationship between a dependent and an independent variable. The analysis, then, should have showed a closer relationship between population and functional score if population is to be used as a surrogate for the service viability of a center.

SUMMARY

The settlement system of Medicine Hat has been impacted by change in both the distribution of functions and the distribution of service centers in the hierarchy. The basic form of the hierarchy with five levels- city, large town, small town, village, and hamlet- has remained largely stable over the time frame considered. There has been some movement of centers between levels of the hierarchy, and

some variations in functions available at each level of the hierarchy. As a generalization, the successive inclusion of bundles of functions in the hierarchy is supported by the research. Within the hierarchy different functions have shown tendencies both toward centralization and diffusion. The primacy of first, second and third order centers is increasing as a result of these tendencies, while the lowest order centers have stagnated at a minimal level of service provision.

A review of travel times between centers shows that the separation of places in time-space is decreasing. Although the road network itself has not been significantly altered since 1950, improvements to the quality of the road surface have favored larger centers. There is no evidence from the sources considered that suggests that the distribution of centers is becoming more regular. Instead, this portion of the review is intended to illustrate that larger centers have become more accessible to consumers. Consumers are now "closer" to larger centers than was formerly possible.

Change in the settlement system is by no means complete. Instead, the factors which alter the settlement system will continue to act on the settlement system and the retail landscape. Chapter VI will examine the impact of these findings on the hypotheses proposed in Chapter III.

CHAPTER VI

TESTING OF THE HYPOTHESES

INTRODUCTION

The analysis preceding this chapter was based on the assumptions inherent in the concepts of initial advantage and relative location. That is, the initial population and functional score of a service center were assumed to be predictors of the subsequent growth performance of a center. As well, the location of a service center relative to other centers and improved roadways, is expected to influence the growth or decline of the central places.

This study has examined the changes occurring in the system of settlements, and attempted to include temporal variations in the independent factors. This moves the analysis from a static reporting to a dynamic review of the growth and decline of service centers. The variables considered over the time frame were selected to shed some light on the processes altering the structure of the system and the status of individual centers. This chapter determines if the independent variables considered actually provide a model of the process of change that could be applied to other settlement systems. Although every variable altering the settlement system could not be

explored in this study, it is hoped that the variables considered will adequately describe and explain the reorganization of the settlement system.

Hypothesis One

The first hypothesis considers the relationship of initial functional score to the growth performance of the center. It predicts that centers with a higher relative initial functional score will grow.

The functional score of the center represents the status of the center. The analysis can be compared to the research of initial advantage theorists into the relationship of population to the growth performance of centers, as both variables are used to measure the status of service centers. This suggests that the initial advantage approach has some utility in predicting the subsequent growth or decline of service centers in the study area.

The first hypotheses is supported by the analysis for centers which are functioning as service centers. The evidence suggests that as centers increase in functional score, further functional centralization is encouraged. That is, as the availability of functions in a center increase, further functional concentration results. Consumers will shift their support to centers where consumer demands can be met. Larger centers with greater numbers of

functions and a more diverse array of functions will attract increasing consumer support. Centers with low initial functional scores will lose custom to larger service centers.

Location apparently plays a role in growth performance of service centers. Several centers proximate to Medicine Hat had functional scores which were below the midpoint score of centers on the same level of the hierarchy. That is, these centers provided a low level of goods and services to their residents and to the population in the surrounding hinterland. Residents in these centers patronize retail and service establishments in Medicine Hat while residing in the smaller center. They may be "residentially-held" by a preference for small town living conditions, or attracted by perceived lower taxes and housing costs. If consumer demand patterns are unchanged, eventually decreased levels of consumer support will cause the smaller center to lose most of its retail and service functions. The center will cease to act as a service center, but may remain viable as a non-service center by assuming a new role as a satellite population center for Medicine Hat.

This analysis preceded from the basic concept of initial advantage: that is, that the growth performance of a center over a period of time is assumed to be a function of conditions pertaining at the beginning of the test period.

In this analysis, the functional score of a center was used to anticipate its growth or decline. As a generalization, centers in the higher orders of the hierarchy tended to grow, while lower order centers were more likely to decline.

Higher order centers benefited from the centralization of population and functions to the higher levels in the hierarchy. The centralization of population and services has been discussed previously in this study and will not be reviewed here. The analysis does, however, support the assumption that the initial functional score of a center does provide a useful measure for generalizing the subsequent growth performance of the center.

The analysis did show some exceptions to the use of initial advantage as a predictor of change. Maple Creek, for example, declined from the second to the third level of the hierarchy over the test period. It is likely, however, that extenuating circumstances have resulted in the unexpected decline of a higher order service center. The consideration of rural population decline (see Table 6.1) and the impact of loss of hinterland population on Maple Creek has resulted in a decline in status from the second to the third level of the hierarchy.

Table 6.1 Population, rural/ urban, Saskatchewan, 1951-1991

	1951	1961	1971	1981	1991
total population	831,728	925,181	926,242	968,313	988,928
per cent rural	48.0	40.8	25.2	22.9	20.7
per cent urban	52.0	66.6	74.8	77.1	79.3

source: Economic Development, Province of Saskatchewan

Empress and Elkwater declined from third to fourth level in the hierarchy in 1960 and never regained higher status. Decline in Empress is likely due to its reliance on a declining hinterland population and its isolation from primary highways. Elkwater's change in status is more complex. Due to its location in Cypress Hills Provincial Park, the center has enjoyed status as the only "resort" community in the settlement system of Medicine Hat. This status has not equated to a high level of servicing in the center, however. In general, the Park is a destination for cabin owners or trailer campers (who purchase goods in Medicine Hat before leaving for the Park) or individuals on day trips. The center contains one motel. a restaurant/laundry mat/convenience store complex, and little else in the line of commercial services. It is unlikely, due to the Park's isolation from a major population base, that the level of servicing will every approach that found in other resort communities such as Banff.

Hypothesis Two

The second hypothesis predicted the effects of time-space convergence on the growth performance of service centers. For each place and for each test year, the time-distance to Medicine Hat was measured. Road surface conditions and estimated travel speeds were also considered, to indicate improvements in overall trip speed and comfort.

The location of the center relative to Medicine Hat appears to have some influence on the growth performance of the center. Villages and hamlets in close proximity to Medicine Hat generally contain a below average number of services when compared to other centers in these orders of the hierarchy. Dunmore, as an example, is located only four kilometers from Medicine Hat. It has provided a very low level of servicing throughout the study period, but continues to survive as a alternative to "city life". Currently, population in the center is as it attracts residents interested in acreage development. Seven Persons, located less than 20 kilometers from Medicine Hat, is surviving in much the same way. The minimal level of services available does not appear to be a deterrent to residents looking for a more rural lifestyle.

The exception to this pattern of influence is the Town of Redcliff, which contains a higher than average number of

goods and services. It is important to note, however, that the functions available in Redcliff in many cases depend on a threshold population much larger than that of the Town. The functions are patronized by residents of Medicine Hat as well as Redcliff and the surrounding rural area. Functions such as green houses attract consumers who travel by automobile to access a greater range of products or perceived lower costs. It is surprising to note that although one would expect lower taxes in a smaller center, the reverse is true. The equalized mill rate for Medicine Hat has been significantly lower than Redcliff since 1971 (the first year that comparative information was made available). In 1991, the equalized mill rate (municipal portion) for Redcliff was 19.0, compared to 10.7 for Medicine Hat (Alberta Municipal Affairs Comparative Statistics, 1991). Functions that do locate in Redcliff still may require a much larger threshold population than the Town can provide.

A consistent pattern also does not emerge when the growth performance of a center is expressed as being dependent on the location of the center relative to improved roadways. Again, it appears that the initial functional content of the center is a more accurate predictor of its subsequent growth or decline. Larger centers are in all cases and in all test years located on the best available

quality of road surface. As noted previously, roadways improvements are initiated by traffic volumes. The relationship between improved roadways and service center growth is the converse of what was predicted in the hypothesis. Roadway improvements are dependent on the level of traffic use between service centers, with higher traffic volumes occurring between larger centers. Roadway improvements, then, are a function of initial population size.

Some smaller centers benefit from their location relative to improved roadways. Suffield, located 35 kilometers west of Medicine Hat on the TransCanada highway, has shifted from level five to level four during the time frame under consideration. Its proximity to the Canadian Forces Base and the highway will help to sustain a level of servicing for the traveling consumer, temporary base residents, and for hamlet residents.

The second hypothesis also implied that the settlement system would reorganize into a more regular, dispersed hierarchy with fewer service centers as the smallest centers declined and no longer provided goods and services to their potential customer base. This again was not proven in the analysis.

Change at the level of the individual center shows some variations in growth performance, but only one (Onefour) has

actually disappeared from the service center settlement hierarchy. That settlement still remains as a population locale and prairie agricultural research center. Although decline is most prevalent in the lowest orders of the hierarchy, even the smallest centers have remained as part of the settlement system. Buffalo declined from level four to level five in 1960 and never regained level four status. Although the level of servicing in the center continues to remain among the lowest in the settlement system, it remains in the hierarchy due to the grain elevator, church, post office, and school that were in the center in 1990. Hays also declined from level four to level five and never recovered status. A grain elevator, garage, general store, church, and post office are all that remain in this center.

The settlement system has not evolved into a more regular, dispersed system of settlements over the time frame considered. Instead, the hierarchy has remained stable both in the total number of service centers and the distribution of centers within levels of the hierarchy.

SUMMARY

These findings are illuminating, given that they suggest that competitive processes affecting the growth performance of service centers have little to do with the relative

location of the center. Instead, the initial functional score of the center is a more consistent predictor of the growth or decline of a service center.

It would be premature, however, to abandon any further study of the influence of relative location on the reorganization of the settlement system. Although no meaningful generalizations (excluding the expected influence of Medicine Hat) were proven here, other studies have shown a relationship between time-space convergence and the growth performance of service centers. It is unlikely that improvements in travel time and road conditions have not altered the travel patterns of consumers in the settlement system. However, the approach to analyzing the impact of convergence considered here provides no evidence of this trend.

Initial advantage research has shown that reasonably consistent results can be obtained for the positive relationship between the functional score of a center and its propensity to grow. Generally, centers with functional scores above the midpoint levels for their order in the hierarchy will grow. Centers below the median are more likely to decline.

Although this study has supported the research on initial advantage theories and the centralization of services, no real contribution has been made to explain the

variations in growth rates as part of a process of change. As well, no advance has been made on the traditional methods of explaining the reorganization of settlement systems.

CHAPTER VII

CONCLUSIONS

This study has examined the changes occurring in a system of service centers, and used variations in the functional score of the service center as the measure of growth or decline in center status. The vast and varied literature on settlement systems and service centers suggested numerous possibilities for study. In this study, the initial advantage of the center, as measured by the initial functional score of the center, and the location of the center, relative to Medicine Hat and improved roadways, were used to evaluate the growth performance of the individual centers. Data on these two variables and on the change in the status of service centers were collected for five discrete dates. The data were then arrayed into hierarchies, ranked by functional score. A forty year time span was considered to provide opportunity for trend analysis, and, perhaps, provide some indications on the direction of future change for all small service centers on the Prairies.

Overall, the analysis showed that the relative location of centers, that being that centers located on superior road surfaces would increase in functional score more rapidly

than centers on poor quality road surfaces, and centers located distant from Medicine Hat would be more likely to grow, while those closer to the city would be more likely to decline, did not consistently indicate subsequent growth performance. have a substantial impact on their subsequent growth performance.

Small villages and hamlets located close to Medicine Hat contain very low levels of services, and appear to serve more as population locales than as *service* centers. It is also true that certain services may be attracted to these centers because of their location relative to Medicine Hat. One interviewee noted that Dunmore was a good location for a trucking company because it was close to the city and not in the city.

Redcliff, one of the larger towns considered in this study, in some ways benefits from its location relative to Medicine Hat. The center contains a higher level of servicing for particular functions than would be expected for the population base. There is a high number of greenhouses in the center- more than the population size would suggest could be supported. Consumers from Medicine Hat are traveling to Redcliff to support these specialized functions.

It is possible, then, that location relative to Medicine Hat has different impacts on centers at different levels of

the hierarchy. Smaller centers may be negatively impacted; larger centers may find niche markets and thrive due to their location.

The predictability of growth or decline based on location relative to improved roadways provides more growth predictability. Several interviewees indicated that the location of their center off a major roadway had contributed to the decline of the center. It is also true, however, that road improvement programs are based on traffic counts, and it follows that larger centers with higher initial levels of servicing would attract more traffic. Small centers "fortunate" enough to be located on a major roadway between two higher order centers would also benefit from the road improvement.

The variable that appears to allow the most predictability of growth performance is the initial functional score of the center. Centers which have achieved a certain level of servicing appear to have the ability to create growth, or at least ward off decline.

The first order center, Medicine Hat, is largely immune to competition from the lower order centers. Brooks, a second order center, also has achieved consistent growth. Maple Creek, however, does not appear to contain the "intrinsic value" which generates growth performance. The

center had declined in functional score since the beginning of the time period under examination.

For the third order centers, Redcliff shows stable performance; Bow Island remains at the third level with wider variations in functional score year to year. Empress and Elkwater both declined substantially in functional score between 1950 and 1960 and never regained third level status.

Earlier research has suggested a correlation between the size of place and the propensity to grow. These findings were consistent with the conclusions obtained in this study for the smaller centers. A general pattern of small center decline was found to be evident. Those centers on the two lowest levels of the service center hierarchy appeared to be most likely to be characterized by relatively large changes in functional score, and change was generally in a downward direction.

As population densities decrease and as rural residents continue to out-migrate to larger centers for educational and employment opportunities, the small centers will continue to decline. The future of these centers as foci for trade and commerce is uncertain at best.

Other factors, not considered in this study, may have a role in small service center decline. Population can be an adequate indicator of growth performance. It is generally true that larger centers grow and smaller centers decline.

However, this variable would not provide an accurate depiction of the role of the center as a foci for good and service provision. This study focused only on those centers providing goods and services to residents and their hinterland population.

Variables such as the decline of rural population density, the related increase in size of land holdings, the value of crops in world markets, or the start up costs of farming or ranching may be important to the future of small centers. Further empirical research could provide answers as to the value of these indicators in predicting the growth performance of centers.

Changes in consumer behavior also alter the settlement system. The influence of place of employment on shopping patterns can alter the settlement system, as consumers purchase goods and services closer to their place of employment more often than place of residence. Alterations in shopping patterns caused by the exposure through the media to an urban centered culture, increased disposable incomes, and advertising by chain stores and franchises also are factors in the decision-making of rural and small center consumers. In this study, time does not appear to be a deterrent to travel; small center residents appear to be willing to incur the costs of transportation and time to gain the perceived advantages available in the larger urban

centers. Further research into the impact of consumer behavior on the settlement system is required.

Governments continue to have a role in the growth performance of small centers. Although provincial government roadway infrastructure and roadway paving programs may have contributed to the decline of the small service center, other programs have attempted to slow the consolidation of service centers and the centralization of goods and services. The investment in public infrastructure, such as rural hospitals, is seen as a means of maintaining population and regional focus on a particular center. Rural schools can be kept open long after the numbers of students in their normal catchment area declines, if students are bussed in from other locations. The current reorganization of school and hospital boards suggests that the economies created by artificially tampering with public infrastructure threshold levels can no longer be supported.

With unlimited resources, governments could create artificial capacities and possibly slow the trend to small center decline. However, the size of the provincial and federal debts make this an unlikely scenario. Currently, the provincial government is reducing the unconditional grants it gives to small centers. From 1992/93 to 1996/97, unconditional grants to municipalities will be reduced by 63 per cent. For some of the smaller municipalities, the

reduction in grants represents their entire operating budget. These centers will be required to "restructure" back into the rural municipality or seek out means of cost savings through joint servicing agreements with other municipalities.

Governments will have to examine how, where, and why expenditures are made to evaluate if programs are having any impact, and if the delay of the inevitable is possible.

Although it is difficult to predict the growth of service centers, change itself appears to be inevitable. Small centers are losing elevators, implement dealers have centralized to higher orders in the hierarchy, bulk food stores are taking an increasing share of food shopping dollars from small center groceries, and functional scores for small centers are declining. The variables considered here may not be the predictors of change, but it is irrefutable that change is occurring in small centers dotting the Prairies. Small centers are losing their role as providers of goods and services. Rural residents themselves are speeding this demise as they continue to patronize facilities in urban centers while under-utilizing functions closer to home.

Similarities can be drawn to the retail landscape in large urban centers. The "mom and pop" store, once an integral part of every neighborhood, has been subsumed by

international chain stores and franchises. The smaller scale grocery store is being replaced by mega-stores offering volume purchase pricing. Hardware stores, as well, have recently been affected by similar trends, as evidenced in the location of four hardware "hyper markets" in the Edmonton region alone in a one year period. Custom is drawn from the small, limited establishment to the larger scale retail or service functions with better pricing and better selection, just as small centers lose custom to their larger, better serviced competitors.

In assessing this study, it is apparent that the research has not led to an empirical means of predicting the future growth or decline of service centers. Overall, however, the study supports the findings of other researchers: that the smallest centers in a settlement system are likely to decline, and services continue to centralize to the highest orders of the settlement system.

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Appendix A: Interviews

Appendix A: Interviews

Location	Interviewee	Summary of comments to questions: 1. Where do people from this center shop? 2. What is the future of the center?
Consul	Co-op worker	- The only thing Consul has over other places in the area is we have the school. Last year, they graduated 7 or 8 students. - People from around here stay here more than they seem to in other areas. Everyone has to get second jobs, though, to make a go of it. - We have the local RCMP detachment here- it probably makes this a better place to be. - People from Consul shop in Maple Creek or go through to the Hat for bigger items. We can supply most everyday needs from here.
Robsart	general store owner	-Farm and town population is way down. - Out of 15 houses in town, probably 10 are deserted. - We go to Medicine Hat mostly for clothes, go to Maple Creek for some other things. - The biggest problem we have is all the farmers are selling out. - There used to be a restaurant, hotel, and a theater here, but they closed down in 1953 or so. - Kids here go to Medicine Hat for school. - Paving the highway is what drew people away. Now you just jump in your car and go.
Eastend	town hall-office administrator	- also farms in area, office job is part time - people from here go to Regina or Maple Creek. You have to go through Maple Creek to get to Medicine Hat unless you take the back roads, so you might as well stop there. - Lots of people go to the States for stuff- it's a weekend trip to Great Falls, better deals and it's a weekend away. - The town is doing really well. The population is over 700, not a lot of new businesses are going in but those that are here are doing OK.

Maple Creek	Town office-town administrator	- Maple Creek is 8 km off the highway. This is a bit of a problem in attracting business into town because there are gas stations, a Case dealer, and a motel right on the highway. - We have all the implement dealers and three grain elevators. - People might go on to Medicine Hat if they can't find something here. - Maple Creek is thriving- we are the major service center for all the small communities and all the farmers around here.
Piapot	general store worker (co-op)	- this store is an interesting story. The town was losing business, mostly to Maple Creek but also to Medicine Hat. We sold shares in the co-op just to keep it in town. People supported the idea so we're still here. - we try to do a lot of things as a community, to promote community spirit. - People live here because we want to. No one wants to move anywhere else. This is a really great place to live. - You have to go to Maple Creek for some things, the Hat for others. I try to buy everything I can right here.
Fox Valley	convenience store owner	- Fox Valley is the center for the area. We have the rural municipality office, five elevators, a grocery, a restaurant, lots of things. - We shop at Regina or maybe go to Maple Creek. I don't know many people who go into Medicine Hat on a regular basis. - We used to have a school but it shut down, so did the Esso. - (1 km gravel access)
Leibenthal	general store owner	- Also farmed in area, but not anymore - This is a combination general store/gas station/post office - There's only 6 houses in town, we rely on farm people to shop here. - Most people go into Maple Creek for immediate things, or into the city on weekends. - We go to the city at least once a month and do most of our shopping for things other than what we have here.

Mendham	general store worker	- We're not right on the highway, so I suppose we lose some traffic to other places because of it. - The store serves the rural area, mostly. People come into town to curl in the winter and stop in to get a few things. - Most of the time, people would go to Medicine Hat- it's the closest center for bigger purchases. Sometimes you go into Maple Creek if you're in a really big hurry. - If things keep going the way they are, there won't be any reason for there to be a town here. Probably just Maple Creek will be left in all of southwestern Saskatchewan.
Burstall	grocery store owner	- used to farm in area, purchased grocery store from family who retired to Medicine Hat, probably will retire there. - hard to say if I'll be able to sell the store or just close it. There's another grocery in town. - Burstall is a good town- there's still a lot of services- we get people from all over stopping here. - Medicine Hat is the main shopping place for residents. Some people go to Maple Creek for some things, like government offices and such because its in Saskatchewan. - A lot of farm people retire to Maple Creek or Medicine Hat. People who live here often go south for the winter, mostly to Arizona.
Hilda	service station worker	- parents farm in the area, I'm going to University of Alberta for agriculture then I'll come back here. Not everyone has someone to take over, some people are selling off and moving to town or to Medicine Hat. - People here go to Medicine Hat for most things. Maple Creek is about the same distance, but you might as well go to where everything is. - you can get a few things in Hilda, but not much. - there isn't much happening here. We usually go to Medicine Hat on the weekends for something to do.

Schuler	grocery store owner	- We still have kindergarten to grade 9 here, after that the kids go to Medicine Hat. - We never had a theater, but there used to be movies in the community hall in the 1950's. - We had three hardware stores and three groceries at one time. Now there's just one. - We used to have three farm equipment dealers- now you go to the Hat for parts. - Natural gas has helped the economy around here. You hope you have some on your property. - The loss of rural population is the biggest reason for decline in small towns. - The roads didn't help either. The traffic goes down the highway to Medicine Hat; it doesn't stop here. - The Hutterites have bought up a lot of land, but they just don't shop.
Empress	general store owner	- In the 1960's, we had three general stores. - We're losing all the rural population. People are retiring, no one is taking over, and the land gets sold off among the neighbors. - Nobody new is coming in here. - We are pretty isolated, people depend on this store for small grocery needs. - More and more, people are going in to Medicine Hat to shop at Safeways.
Bindloss	gas station owner	- problem with Bindloss is all the farmers retire to Medicine Hat instead of moving to town. - the general store (only grocery store) closed in the mid-1970's. - there used to be a cafe, but that closed probably in the late 1960's. - the school is still here. Believe they have about 100 students from grades 1-11. Students sometimes go to Medicine Hat even when they could go to Bindloss. - no real future in Bindloss; probably will move to Medicine Hat myself.

Buffalo	elevator operator	- there isn't much besides the elevator in Buffalo. - people here go to Medicine Hat for work, shopping, other services- you can't get anything here. - sometimes there are dances at the community hall- these draw people from all over. - the only reason Buffalo is still on the map is because of the elevator. If it wasn't so isolated, it probably wouldn't have an elevator. - (3 houses, 2 elevators)
Jenner	gas station owner	- We have some land in the area and have this business as well. - There's a new hotel and restaurant- it's used by the oil and gas workers. That's who most of our business is from. - There's less and less people farming around here. It isn't as profitable anymore. No one new moves in and starts up, there's no way they could afford to do it. - If there wasn't the gas activity, we wouldn't be here. - We shop at Medicine Hat. So do most people. - Most of the gas offices where the rig and pump workers are located in Medicine Hat, some are in Calgary.
Iddesleigh	general store owner	- This is just a small town, it's no threat to Medicine Hat. - Most people go into Brooks for groceries and such, and into Medicine Hat for bigger purchases. - We supply day to day needs. A lot of people come in here.
Patricia	grocery/gas station worker	- We get a lot of traffic from people going to Dinosaur Park. - People come for the rodeo every year from all over the place, even the States. - I go to Brooks for most things. I probably go in to the Hat about once every 3 weeks, to go to the Mall or if I have a Saturday off. - You have to go to Brooks or the Hat- this is more a convenience store than a real grocery store.

Brooks	implement dealer	- Brooks is the focus for the whole area from Ralston to Bassano- everybody comes here. - I figure in 20 years, all that will be left will be Medicine Hat, Brooks, maybe Bassano, and Bow Island. All the small towns will die out after the residents in them die or retire. - People from Brooks can get everything they need in Brooks. I only go into Medicine Hat if I have to go to the Compensation Board office or other government business.
Tilley	desk clerk-hotel	- (4 km off TransCanada Highway) - We get a lot of oil and gas related traffic, most of the guests are rig workers. - Not much reason to be here- you can go to Brooks for work or shopping, or go to Medicine Hat. Some people go to Calgary on a regular basis. - We have a pretty good group of businesses. There probably won't be a lot more coming in, but no one seems to be going out of business.
Rolling Hills	resident	- (stopped resident in yard) - There used to be a garage here but it just closed. - There never has been an elevator, but the town is losing ground because rural people don't come here anymore. - There's no rail line here, either. - We go into Medicine Hat if we need anything- we don't need many things.
Rainier	no interview	- Elevator closed - No business district at all - Feed lot on edge of town - Few residences, very quiet, no one apparently around

Scandia	general store owner	- Scandia is probably the best town in the area. We have a lot of things to do here, it's beautiful country. - People here haul grain to Vauxhall or Brooks- we don't have an elevator anymore. - The hardware store and coffee shop are gone. - Kids go to Rainier for junior high and high school in Brooks. There's no school here anymore. - Bigger farms mean less people. - People here go to Medicine Hat for most of their shopping. Sometimes we go to Calgary or Lethbridge just for something to do. We go to Rolling Hills for slow pitch in the summer. - Scandia will be around for a long time. Lots of people moved in the 1970's when oil was hot around here, then they moved back out. We had a homecoming a few years ago and hundreds of people showed up.
Hays	general store owner	- The rural population keeps the town services going. - Irrigation keeps the rural population stable. - Oil has made a big difference- we get a lot of pass through traffic. - They keep threatening to shut down the elevator, but it's still open. - The implement dealer closed this year. - Most people retire to Taber, but they do their shopping in Medicine Hat.
Vauxhall	grocery store owner	- The town is slowly losing population. - People from Vauxhall shop in Taber- I don't think they would go to Medicine Hat. - People from Hays might go to Medicine Hat.
Taber	gas station owner	- I'd guess no one would go to Medicine Hat over Lethbridge. It's further away, and Lethbridge is bigger. - Most people run into Bow Island if they have to get something fast, but most of the stuff in Bow Island is available here.

Foremost	hardware/ implement store owner	- opened in 1964 - farms are getting larger, lots of buyouts - Hutterites buy up most of the land because they're the only ones that can afford it. They don't deal much with businesses in town. - There used to be six implement dealers, now there is one. - People from Etzikom go to Medicine Hat. - The streets in town were paved three years ago. - Foremost residents go to Lethbridge to shop or cross the border over to the States. We can cross at Sweet Grass- doesn't take too long to get there. - Nobody would go to Medicine Hat unless they had something to do or somebody to visit there. It's a long drive. - People from Foremost like it here. The elevator is still active. - Biggest change is in the way people farm. Everybody wants it right now. - Maybe someday there won't be a town, but right now, things are still OK here.
Nemiskam	farmer from area- stopped on road	- there used to be an elevator, but rail service was cut in the 1960's and the elevator closed some time after that. - I went to school here- it closed in the early 1950's. - there used to be other things here, but the loss of the elevator pretty much sealed off the town. - We go to Lethbridge for groceries, other things, maybe to Bow Island for parts. - (appears to be four occupied houses, gravel access to center 2+ kilometers)
Etzikom	general store worker	- There isn't much left here. - The New Holland dealer closed and the building is up for sale. - There's probably about 20 houses in town with families or people in them. People often move the whole house out to a farm or something if its empty. No point just leaving it here. People here go to Medicine Hat for everything, or maybe stop in Redcliff if they don't want to deal with the traffic.

Manyberries	2 coffee shop patrons at hotel	- non-resident lives in Medicine Hat. - This town is in decline. The only reason there's a hotel or restaurant is because of all the natural gas activity in the area. Nobody lives here anymore. People have land holdings 20 times the size of what people used to have. - Four more families sold out in the last year. - It's easier to drive into Medicine Hat than to poke around here and hope you can find something. - Manyberries used to have a car dealership and a lot of other things. - You can't support them when no one lives in the area. Most oil or gas workers aren't buying cars when they're here.
Orion	gas station owner	- There used to be 5 people every quarter section. In the 1920's there was a lot of dry years, and the population dropped. - We lost 40 or 50 families in the last 3-4 years. - Most go to Medicine Hat, some to Lethbridge. - People go to Medicine Hat for supplies and end up getting everything. - We used to have 2 lumber yards, a bank, 2 Chinese restaurants, lots of things. - The roads and automobiles moved people out of town. It used to take 2 hours to get to Medicine Hat. Now you're there before you know it. - Gas stations in Medicine Hat can cut prices- it costs money to get gas hauled out here. - We get about 25 customers a day, and can fix cars as well. We do the work for about half of what it costs in the Hat. - We've been here for 50 years and we'll be here 50 more.
Wildhorse	Canadian crossing guard	- people from Medicine Hat and all over southern Alberta cross at Wildhorse. - We go to Medicine Hat or Havre for things we need here. No one really lives here, there's just the border crossing.
Walsh	interpretive center worker	- work at the interpretive center in summers, probably will be moving to Medicine Hat in the fall if I get into the college. - People come here from all over Canada and the US to go to Fort Walsh. This isn't a shopping destination town- I suppose most people go to the Hat or just shop at where they're coming from.

Irvine	groceteria/ general store owner	- Irvine is in a good location- far enough from Medicine Hat, but close enough to get there. - people come to the store for small things, but do their main shopping at the Co-op or the mall in Medicine Hat. I do my main shopping at the Co-op. - people live here because it's a nice town. People will always live here for that reason. Not everyone wants to live in a city.
Dunmore	MD office/ shop- foreman	- Lives in Medicine Hat - Lots of new residents out here. Acreage development has gone crazy, everyone wants to move out of town and get a piece of land. - Dunmore is a good location for trucking companies and other small industries- close to town but not in it, and right on the highway. - People go to Medicine Hat- you could throw a rock and hit it if you wanted to. - The point of Dunmore isn't shopping, its moving out of town.
Redcliff	grocery store manager	- I was born in Medicine Hat. I moved here when I was working at Domglass, then we stayed here because it's cheaper than the Hat. - Redcliff is really part of Medicine Hat. There's no big difference. Eventually, the city and the town will grow right into each other. - We have some industrial plants, and the green houses, people from the Hat come here for those things. Most people seem to shop in town if they can. Why not go to the mall and get everything if you can do it all at once. - It would be better if the mall was on this side of town. Redcliff probably does as well as it does because the mall is on the other side. - We'll be part of the city soon. I heard the police force will be shutting down and Medicine Hat Police will do Redcliff as well.

Suffield	gas station owner	- The army base didn't start here till 1945 or '46. We moved here because my father worked at the Base, and started the gas station on the highway because there was a need for the service. - The British came out here about 20 years ago. They get about 2000 soldiers every two weeks moving through here for training. Some of them hate it here- it's too flat and empty. Other ones are trying to stay here. - There's a lot more oil and gas activity in the area then there used to be. This creates some traffic for us. - A lot of people stop here on their way to town- people shop in Medicine Hat, you can't buy anything here. - We do some servicing, but most people buy their cars and have them serviced in the Hat.

Appendix B: Functions Available in the Trade Area of Medicine Hat

Functions available in the Trade Area of Medicine Hat, 1950-1990

implement dealer
grain elevator
feedlot
appliance/furniture sales
automobile sales
auto service/garage
bakery
clothing store
confectionary
convenience store
dept. store
florist/greenhouse
general store
grocery/meats
hardware/bldg. supplies
jewelry
pharmacy/drugs
photographers
restaurant/cafe
sports store
accountant
architect
auctioneer
barrister
blacksmith
funeral home
hair salon/barber
hotel/motel
laundry/dry cleaners
liquor store
pool/billiards
taxi
tradesperson/contractor
theatre
travel agency
trucking Co.
veterinarian
chiropractor
church
community hall
doctor
dentist
fire hall
hospital/clinic
optomitrist
police/RCMP
post office
school
senior's home
town or MD office
arena
curling rink
bank/credit union
insurance
real estate

Functions Available in the Trade Area of Medicine Hat, 1950

	imp	ele	flt	app	sal	ser	bak	clo	cof	dep	flo	gen	gro	har	jew	pha	pho	res	spo	acc	arc	auc	bar	bla	fu	hai	ho	lau	liq	poo	tax	tra	the
Bindloss		3			1	1						1		1				1															
Bow Island	2	5			1	5		1				3	1	3				1									1					1	
Brooks	4	3		1	4	4	2	3	1			2	5	3	1	2		2		1		1	4			2	3	1	1		1	6	
Buffalo		1	1																														
Burstall		4				2						1	2	2				2								1	2						
Consul		1				2						1						2												1		1	
Dunmore		2				1																											
Elkwater						1						2						2															1
Empress	1	4	2		1	2						2	1	1				1									1					1	
Etzikom		3				1																											
Golden Prairie		3				1																											
Hays		0				1							2	2				1															
Hilda		5			1	1						1		1																			
Iddesleigh		2																															
Irvine	1	5	1			4						1		1																			
Jenner		2																															
Leibenthal																																	
Maple Creek	2	2	2	2	5	6	1	1	1			5	5	3	1	2		4					2		1	4	2		1	1	1	6	
Manyberries		2				1						1		1																			
Medicine Hat	9	2	4	18	4	26	5	19	3	2	6	2	34	5	3	6	1	16		2	1	3	5	1	2	9	4	3	1	3	4	25	2
Mendham		4				1						1																					
Millicent		1																															
Onefour																																	
Orion		2																															
Patricia		1																1															
Piapot		3				4						2		1				1															
Rainier		1				1						1		1													1						
Ralston																																	

Ravenscrag		2																													
Redcliff	1					2		1			1	1	3	1		1		2							1	1	1	1		1	4
Retlaw	2	2	1		1	1						3		1		1															
Richmound		3				1																									
Robsart	1	3				1						1		1																	
Rolling Hills						1						1																			
Scandia		2				1						1		1																	
Schuler		4				1						1																			
Seven Persons		1																													
Suffield						1																									
Tilley	2	3			1	2						2		2												1				2	
Walsh		3																													
Total:	25	84	11	21	19	76	8	25	5	2	7	36	53	30	5	12	1	36	0	3	1	4	11	1	3	17	16	5	4	5	7	46	3

tra	tr	vet	chi	ch	com	doc	den	fir	hos	opt	pol	pos	sch	sen	to	ban	ins	rea	Total
				1								1							10
				1								1			1	1	1		29
1		1		3		3	1	1	1	1	1	1	2		1	3	2	3	82
				1	1							1							5
												1				1			18
						1					1	1							11
																			3
					1							1							8
				2		1					1	1						1	23
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				1									1			1			9
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				3		3	2	1	1		1	1	1			1	1	1	76
											1	1					1		8
5	1	3		5		13	3	1	4	3	1	1	7			4	18	7	306
												1							7
																			1
												1							1
												1							3
												1							3
												1			1	1			14
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												1							1

| | | |

Functions Available in the Trade Area of Medicine Hat, 1960

	imp	ele	fit	app	sal	ser	bak	clo	cof	dep	flo	gen	gro	har	jew	pha	pho	res	spo	acc	arc	auc	bar	bla	fu	hai	ho	lau	liq	poo	tax	tra	the
Bindloss		3			1	1						1																					
Bow Island	3	7	1	2	2	9		1				3	3	4		2	2								1	1	1				1		
Brooks	4	3	1	9	2	10	1	4	1	4	1	4	3	2	2	2	4						3		1	2	6	3			7		
Buffalo		1																															
Burstall		5		1	1	1						2		2			1										1				1		
Consul		1				1						1		1			1										1						
Dunmore		1			1	1																					1						
Elkwater						1						1															1						1
Empress	2	4				3						2	1	2			1										1						
Etzikom	2	4				1							1	1																			
Golden Prairie	1	4			1	2						4		2													1						
Hays		1				1						1																					
Hilda	1	5			1	2						1		1			1																
Iddesleigh		1				1						1																					
Irvine	1	5	1			5						1		1													1						
Jenner		1				1																											
Leibenthal						1						1																					
Maple Creek	4	2	3	1	5	8	1	5	1			2	7	7	1	2	6		1		1	2			1	1	2		1		2	12	
Manyberries		1										1		1													1						
Medicine Hat	14	4	3	12	16	44	14	34	15	10	13	1	31	13	8	8	29		5	3	4	14			3	19	21	6	1	2	2	38	1
Mendham	1	5				2						2		2													1						
Millicent		1										1																					
Onefour																																	
Orion		2				1							1	1																			
Patricia		1				1						1					1										1						
Piapot		5				4						2															1						
Rainier		1										1		1																			
Ralston						1						1														1							

Ravenscrag		3																													
Redcliff	1				1	4		1			1	1	2	2		1		1								1	2			2	
Retlaw		2																													
Richmound	1	4			2	2						2		2																	
Robsart	1	3				1						1		1																	
Rolling Hills						2						1						1													
Scandia		2				2						1		1																	
Schuler	1	4			1	1						1		1																	
Seven Persons		1				1																									
Suffield						1																									
Tilley	2	3			2	2						1	1	2													1			2	
Walsh		3																													
Total:	39	93	9	25	35	118	16	45	17	14	15	43	50	50	11	15	0	48	0	6	3	5	19	0	6	25	44	9	2	2	4	63	2

tra	tru	vet	chi	ch	com	doc	den	fir	hos	opt	pol	pos	sch	sen	to	ban	ins	rea	Total
													1						7
	2	1		5		2		1	1		1		4			1	1		62
	4	1	1	3		6	1	1	1	1	1		2			4	2	1	108
													1						2
																1			16
						1					1		1						9
	2																		6
																			4
				2		1		1	1				1						22
																			9
				1									1						17
				2															5
													1			1			14
																			3
						1							1				1		18
																			2
																			2
	1			4		5	1	1	2	1	1		4			2	2	1	103
											1								5
	37	6	3	30		28	10	1	7	3	2		11			14	24	20	584
				1															14
																			2
																			0
																			5
																			5
																1			13
													2						5
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Functions Available in the Trade Area of Medicine Hat, 1970

	imp	ele	fit	app	sal	ser	bak	clo	cof	dep	flo	gen	gro	har	jew	pha	pho	res	spo	acc	arc	auc	bar	bla	fu	hal	ho	lau	liq	poo	tax	tra
Bindloss	1	2	3			1						1																				
Bow Island	4	7	1	1	2	6	2	1				2	3	3		4		2		2		2	1			4	1		1			3
Brooks	6	3	1	2	4	17	1	5	1		1		6	4	2	2		6		4		1	5		1	5	12	4	1			15
Buffalo		1																														
Burstall		5			1	1						1	1	2				2									1					1
Consul		1				1						1		2													1					
Dunmore		1												1													1					
Elkwater						1						1						1									1					
Empress	2	2				1						1		2		1		1				1				1	1					
Etzikom	1	3	1			1						1																				
Golden Prairie		4				1						1																				
Hays		1										1																				
Hilda		5				3						2						1									1					
Iddesleigh		1				1						1																				
Irvine		5				2						1						1									1					
Jenner		1	2			1																					1					
Leibenthal						1						1															1					
Maple Creek	5	2	3	1	8	18		6	1		2	1	2	5	2	3		5		3			2		1	4	4	2	1	1		4
Manyberries		1				1												1									1					
Medicine Hat	18	4	4	13	14	36	7	39	15		8		23	15	5	8		46		6	1	5	9		2	29	29	11	2	3	3	9
Mendham	1	5				2						1															1					
Millicent		1										1																				
Onefour																																
Orion		2				2						1		1																		
Patricia		1				1						1															1					
Piapot		3				3						1															1					
Rainier		1	1									1																				
Ralston						1			1				1					1								1							

Ravenscrag		3				1																									
Redcliff	3				1	5	1		3		2	1	2	3		1		3							2	2	1			9	
Retlaw		2																													
Richmound	1	4			1	3						1		1												1					
Robsart	1	3				1						1		1																	
Rolling Hills						2						1						1													
Scandia		2				1						1		1																	
Schuler	1	4				1						1																			
Seven Persons		1				2																									
Suffield						1																									
Tilley	1	3										2		1												1				2	
Walsh		3																													
Total:	45	87	16	17	31	119	11	51	21	0	13	30	38	42	9	19	0	71	0	15	1	9	17	0	4	46	63	18	5	4	3	43

the	tra	tru	vet	chi	ch	com	doc	den	fir	hos	opt	pol	pos	sch	sen	to	ban	ins	rea	Total
					1				1				1							11
1		4	1		6		2	1	1	3		1		4			2	2	1	81
1		15	9	2	5		8	1	1	5	1	1		3			5	5	3	174
														1						2
		1			1				1					1			1			20
					1									1						9
			1									1		1						4
1					1															6
					2		1			1				1			1			19
					1															8
													2							8
					2															4
					3															15
																				3
					2									1						13
														1						6
														1						4
		7	1		6		5	1	1	2		1		2			3	1	1	117
																				4
2		14	2	4	33		33	8	2	7	3	2		18			10	18	16	536
																	1			11
																				2
																				0
																				6
														1						5
																	1			9
														1						4
					1		2		1					1			1			12

					1				1				1						7
		21	1		2		3					1	3			1			71
																			2
					1								1			1			15
													1						8
					1								1						6
					1								1						7
													1						8
									1										4
													1						2
					2				1				1			1			15
																			3
5	0	63	14	6	73	0	54	11	11	19	4	7	0	51	0	0	27	27	21	1241

Functions Available in the Trade Area of Medicine Hat, 1980

	imp	ele	flt	app	sal	ser	bak	clo	cof	dep	flo	gen	gro	har	jew	pha	pho	res	spo	acc	arc	auc	bar	bla	fu	hal	ho	lau	liq	poo	tax	tra
Bindloss	1	3	4			1						1																				
Bow Island	4	5	1		4	6	2	2	1			1	3	2				3		2		1	2			6	1		1			8
Brooks	4	2	3	11	12	41	2	18	5		3		6	7	3	6		17		9		4	7		1	6	12	4	1	1		58
Buffalo		1																														
Burstall	1	2		1	1	2						2	1	3				2								1	2					2
Consul		1	1									3						1								1	1					
Dunmore		1										1		1				0									1					
Elkwater						1						2						1									1	1				
Empress	1	2			1							1		1				1				1				2	1		1			
Etzikom	1	3	1									1																				
Golden Prairie	1	2										1																				
Hays		1				1						1																				
Hilda		4				3						1															1					
Iddesleigh		1				1						1																				
Irvine		3				2						1						1									1					
Jenner		1	1			2																					1					
Leibenthal						1						1																				
Maple Creek	4	2	3	2	3	13	2	6	1		1		4	5	1	1		7		6		1	8		2	4	3	2	1	1		12
Manyberries		1				1												1									1					
Medicine Hat	25	5	10	22	26	45	7	39	12		10		21	32	12	17		75		17	4	10	28		3	26	40	8	3	3	4	28
Mendham		5				1						1		1																		
Millicent												1																				
Onefour																																
Orion		2				1						1		1																		
Patricia		3				1						1															1					
Piapot		1	1			2						1						1														
Rainier			3			2			1			1																				
Ralston									1				1					1								1						

Ravenscrag		3																													
Redcliff	3				2	7	1		4		5	1	3	2	1	2		4							3	2	2	1		1	8
Retlaw		2																													
Richmound		4		1	1	1								1												1					
Robsart		3				1						1																			
Rolling Hills						1							1	1																	
Scandia						2							1	1																	
Schuler	1	2				1						1																			
Seven Persons		1				1																									
Suffield						1						1						1											1		
Tilley		2				1							1	1				1								1					2
Walsh		3	1																												
Total:	46	71	29	37	50	143	14	65	25	0	19	28	42	59	17	26	0	117	0	34	4	17	45	0	6	50	71	17	8	5	6	118

the	tra	tru	vet	chi	ch	com	doc	den	fir	hos	opt	pol	pos	sch	sen	to	ban	Ins	rea	Total
					1								1							12
1			4	1	6		2	1	1	6	1	1		4		1	2	3	1	90
1			37	3	4	10		8	1	1	5	2	1		7		1	9	7	12	352
					1										1						3
						1						1			1		2	1			24
			1												1		2	1			14
				1																	5
1					1																8
					1									1			1	1			16
					1					1							1				9
					2									2							6
					2																5
					2																11
					2									1		1					7
														1							3
					2									1							11
														1		1					7
														4							6
			7	2	1	8		4	1	1	3	1	1			2	3	1	1	131
			2											16							22
			2	62	6	9	43		46	17	2	20	7	2		3	19	18	36	824
																					8
																					1
																					0
																					5
														1							7
														1			1				8
																					7
						1			1					1			1				8

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Functions Available in the Trade Area of Medicine Hat, 1990

	imp	ele	fit	app	sal	ser	bak	clo	cof	dep	flo	gen	gro	har	jew	pha	pho	res	spo	acc	arc	auc	bar	bla	fu	hal	ho	lau	liq	poo	tax
Bindloss	1	1	4			1						1																			
Bow Island	5	3	1		4	8	1	1	1			2	2	2				2		2		1	1			6	5		1		
Brooks	3	2	2	15	14	25	2	20	7		5		8	9	3	6		21		9		3	8		1	11	2	5	1	1	1
Buffalo		1																													
Burstall		1			1	1						1	2	2				1		1						1	2				
Consul		1	1			2							1	1				1								1	1				
Dunmore		1				1								1													1				
Elkwater			2			2						1						1									1	1			
Empress	1	1			1							1										2				1	2		1		
Etzikom	1	2	1									1																			
Golden Prairie		2				1																									
Hays		1				1						1																			
Hilda		2			1	1						1																			
Iddesleigh						1						1																			
Irvine		1	1			2						1						1									1				
Jenner		1				3																					1				
Leibenthal						1						1																			
Maple Creek	1	2	2	1	5	17	2	7	1		1		6	3	1	2		8		2			5		1	5	6	1	1		
Manyberries	1		1			1												1									1				
Medicine Hat	24	5	7	20	43	46	8	42	18		11		29	31	9	20		92		18	6	7	28		2	52	52	12	3	3	10
Mendham		2				1						1																			
Millicent																															
Onefour																															
Orion		1				1																									
Patricia						1						1						1									1				
Piapot		1			1	2						1						1									1				
Rainier			2			2						1																			
Ralston									1									1								1		1			

Ravenscrag																														
Redcliff	1				4	6	1		2		7	1	3	2	1	2		14		1		1	1		5	2	2	1		1
Retlaw																														
Richmound		3			1	1						1		1												1				
Robsart		2										1																		
Rolling Hills						1						1																		
Scandia						2						1	1	1																
Schuler	1	2																												
Seven Persons		1				1																								
Suffield						1						1						1												1
Tilley		1				4						1	1					3								1				
Walsh		1				3												1												
Total:	39	41	24	36	75	140	14	70	30	0	24	23	53	53	14	30	0	150	0	33	6	14	43	0	4	83	81	21	9	4	13

tra	the	tra	tru	vet	chi	ch	com	doc	den	fir	hos	opt	pol	pos	sch	sen	to	ban	Ins	rea	Total
						1								1	1						11
5	1	1	5	1		6		3	1	1	5	1	1	1	4		1	1	2	1	89
62	1	1	39	8	4	10		9	2	1	2	2	1	1	8		1	2	9	15	362
						1								1	1						4
2						2								1	1		2		1		22
			1											1	1		1				13
			2											1			1				8
	1									1				1							11
1						1								1	1		1				15
						1								1			1				8
						1								1	1		1				7
						2								1							6
						1								1	1		1				9
														1							3
1														1	1		1		1		12
														1							6
																					2
12			3	2		7		3	1	1	4	1	1	1	2		2	2	2		124
2			3											1	1		1				13
90	3	15	70	6	14	50		50	31	2	12	6	1	1	18		3	14	21	26	1031
														1							5
														1							1
																					0
						1								1							4
														1							5
														1	1		1				10
														1	1						7
						1				1				1	1			1			9

| | | |

Appendix C: Functional Scores

Functional Scores, 1950

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays	Hild
implement dealer	25	0.0	8.0	16.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
grain elevator	84	3.6	6.0	3.6	1.2	4.8	1.2	2.4	0.0	4.8	3.6	3.6	0.0	6.0
feedlot	11	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	18.2	0.0	0.0	0.0	0.0
appliance/furniture sales	21	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
automobile sales	19	5.3	5.3	21.1	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	5.3
auto service/garage	76	1.3	6.6	5.3	0.0	2.6	2.6	1.3	1.3	2.6	1.3	1.3	1.3	1.3
bakery	8	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
clothing store	25	0.0	4.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
confectionary	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dept. store	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
florist/greenhouse	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
general store	36	2.8	8.3	5.6	0.0	2.8	2.8	0.0	5.6	5.6	0.0	0.0	0.0	2.8
grocery/meats	53	0.0	1.9	9.4	0.0	3.8	0.0	0.0	0.0	1.9	0.0	0.0	3.8	0.0
hardware/bldg. supplies	31	3.2	9.7	9.7	0.0	6.5	0.0	0.0	0.0	3.2	0.0	0.0	6.5	3.2
jewelry	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pharmacy/drugs	12	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
photographers	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
restaurant/cafe	36	2.8	2.8	5.6	0.0	5.6	5.6	0.0	5.6	2.8	0.0	0.0	2.8	0.0
sports store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
accountant	3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
architect	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auctioneer	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
barrister	11	0.0	0.0	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blacksmith	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
funeral home	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hair salon/barber	17	0.0	0.0	11.8	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hotel/motel	16	0.0	6.3	18.8	0.0	12.5	0.0	0.0	0.0	6.3	0.0	0.0	0.0	0.0
laundry/dry cleaners	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
liquor store	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Functional Scores, 1950

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays	Hild
pool/billiards	5	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
taxi	7	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
tradesperson/contractor	46	0.0	2.2	13.0	0.0	0.0	2.2	0.0	0.0	2.2	0.0	0.0	0.0	0.0
theatre	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0
travel agency	0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
trucking Co.	9	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
veterinarian	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
chiropractor	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
church	19	5.3	5.3	15.8	5.3	0.0	0.0	0.0	0.0	10.5	0.0	0.0	5.3	0.0
community hall	2	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
doctor	22	0.0	0.0	13.6	0.0	0.0	4.5	0.0	0.0	4.5	0.0	0.0	0.0	0.0
dentist	6	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fire hall	3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hospital/clinic	6	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
optomitrist	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
police/RCMP	6	0.0	0.0	16.7	0.0	0.0	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0
post office	25	4.0	4.0	4.0	4.0	4.0	4.0	0.0	4.0	4.0	4.0	0.0	0.0	4.0
school	15	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0
senior's home	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
town or MD office	4	0.0	25.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bank/credit union	13	0.0	7.7	23.1	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0
insurance	23	0.0	4.3	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
real estate	12	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0
Total:	759.0	28.2	107.2	640.1	69.5	56.0	59.5	3.7	99.8	100.8	8.9	4.9	33.9	22.5

Idde	Irvi	Jenn	Leib	Mapl	Many	Medi	Mend	Mill	Onef	Orlo	Patr	Plap	Raln	Rals	Rave	Redc
0.0	4.0	0.0	0.0	8.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
2.4	6.0	2.4	0.0	2.4	2.4	2.4	4.8	1.2	0.0	2.4	1.2	3.6	1.2	0.0	2.4	0.0
0.0	9.1	0.0	0.0	18.2	0.0	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	9.5	0.0	85.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	26.3	0.0	21.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	5.3	0.0	0.0	7.9	1.3	34.2	1.3	0.0	0.0	0.0	0.0	5.3	1.3	0.0	0.0	2.6
0.0	0.0	0.0	0.0	12.5	0.0	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0	0.0	76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
0.0	0.0	0.0	0.0	20.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	85.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
0.0	2.8	0.0	0.0	13.9	2.8	5.6	2.8	0.0	0.0	0.0	0.0	5.6	2.8	0.0	0.0	2.8
0.0	0.0	0.0	0.0	9.4	0.0	64.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
0.0	3.2	0.0	0.0	9.7	3.2	16.1	0.0	0.0	0.0	0.0	0.0	3.2	3.2	0.0	0.0	3.2
0.0	0.0	0.0	0.0	20.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	16.7	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	11.1	0.0	44.4	0.0	0.0	0.0	0.0	2.8	2.8	0.0	0.0	0.0	5.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	18.2	0.0	45.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	33.3	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	23.5	0.0	52.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
0.0	0.0	0.0	0.0	12.5	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	6.3
0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
0.0	0.0	0.0	0.0	25.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0

Idde	Irvi	Jenn	Leib	Mapl	Many	Medi	Mend	Mill	Onef	Orlo	Patr	Plap	Rain	Rais	Rave	Redc
0.0	0.0	0.0	0.0	20.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	14.3	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
0.0	0.0	0.0	0.0	13.0	0.0	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	55.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1
0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
0.0	0.0	0.0	0.0	15.8	0.0	26.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	13.6	0.0	59.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5
0.0	0.0	0.0	0.0	33.3	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	33.3	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	16.7	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	16.7	16.7	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	4.0	0.0	0.0	4.0	4.0	4.0	4.0	0.0	4.0	4.0	4.0	4.0	0.0	4.0	0.0	0.0
0.0	6.7	0.0	0.0	6.7	0.0	46.7	0.0	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	25.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	7.7	0.0	30.8	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.3	4.3	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	8.3	0.0	58.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.4	41.0	2.4	0.0	509.9	34.7	2505.8	12.9	1.2	4.0	6.4	8.0	57.1	28.1	4.0	12.9	241.2

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
8.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	100.0
2.4	3.6	3.6	0.0	2.4	4.8	1.2	0.0	3.6	3.6	100.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	100.0
1.3	1.3	1.3	1.3	1.3	1.3	0.0	1.3	2.6	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
8.3	0.0	2.8	2.8	2.8	2.8	0.0	0.0	5.6	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
3.2	0.0	3.2	0.0	3.2	0.0	0.0	0.0	6.5	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
4.0	4.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0	100.0
0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
57.6	8.9	14.9	10.8	13.7	12.9	1.2	1.3	68.3	3.6	4900.0

Functional Scores, 1960

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzi	Gold	Hays	Hild
implement dealer	39	0.0	7.7	10.3	0.0	0.0	0.0	0.0	0.0	5.1	5.1	2.6	0.0	2.6
grain elevator	93	3.2	7.5	3.2	1.1	5.4	1.1	1.1	0.0	4.3	4.3	4.3	1.1	5.4
feedlot	9	0.0	11.1	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
appliance/furniture sale	25	0.0	8.0	36.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
automobile sales	35	2.9	5.7	5.7	0.0	2.9	0.0	2.9	0.0	0.0	0.0	2.9	0.0	2.9
auto service/garage	118	0.8	7.6	8.5	0.0	0.8	0.8	0.8	0.8	2.5	0.8	1.7	0.8	1.7
bakery	16	0.0	0.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
clothing store	45	0.0	2.2	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
confectionary	17	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dept. store	14	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
florist/greenhouse	15	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
general store	43	2.3	7.0	9.3	0.0	4.7	2.3	0.0	2.3	4.7	0.0	9.3	2.3	2.3
grocery/meats	50	0.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0
hardware/bldg. supplie	50	0.0	8.0	4.0	0.0	4.0	2.0	0.0	0.0	4.0	2.0	4.0	0.0	2.0
jewelry	11	0.0	0.0	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pharmacy/drugs	15	0.0	13.3	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
photographers	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
restaurant/cafe	48	0.0	4.2	8.3	0.0	2.1	2.1	0.0	0.0	2.1	0.0	0.0	0.0	2.1
sports store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
accountant	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
architect	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auctioneer	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
barrister	19	0.0	0.0	15.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blacksmith	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
funeral home	6	0.0	16.7	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hair salon/barber	25	0.0	4.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hotel/motel	44	0.0	2.3	13.6	0.0	2.3	2.3	2.3	2.3	2.3	0.0	2.3	0.0	0.0
laundry/dry cleaners	9	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
liquor store	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Functional Scores, 1960

	Total	Blnd	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays	Hlld
pool/billiards	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
taxi	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
tradesperson/contract	63	0.0	1.6	11.1	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
theatre	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
travel agency	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
trucking Co.	50	0.0	4.0	8.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
veterinarian	8	0.0	12.5	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
chiropractor	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
church	58	0.0	8.6	5.2	0.0	0.0	0.0	0.0	0.0	3.4	0.0	1.7	3.4	0.0
community hall	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
doctor	49	0.0	4.1	12.2	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
dentist	12	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fire hall	7	0.0	14.3	14.3	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	0.0	0.0
hospital/clinic	12	0.0	8.3	8.3	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0
optomitrist	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
police/RCMP	9	0.0	11.1	11.1	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
post office	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
school	38	2.6	10.5	5.3	2.6	0.0	2.6	0.0	0.0	2.6	0.0	2.6	0.0	2.6
senior's home	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
town or MD office	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bank/credit union	26	0.0	3.8	15.4	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
insurance	30	0.0	3.3	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
real estate	22	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total	1163	11.9	193.5	445.6	3.7	31.5	26.4	11.1	55.4	57.7	14.3	31.3	7.7	25.4

Idde	Irvi	Jenn	Leib	Mapl	Many	Medi	Merd	Milli	Onef	Orlo	Patr	Plap	Rain	Rals	Rave	Redc
0.0	2.6	0.0	0.0	10.3	0.0	35.9	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
1.1	5.4	1.1	0.0	2.2	1.1	4.3	5.4	1.1	0.0	2.2	1.1	5.4	1.1	0.0	3.2	0.0
0.0	11.1	0.0	0.0	33.3	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0	0.0	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	14.3	0.0	45.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
0.8	4.2	0.8	0.8	6.8	0.0	37.3	1.7	0.0	0.0	0.8	0.8	3.4	0.0	0.8	0.0	3.4
0.0	0.0	0.0	0.0	6.3	0.0	87.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	11.1	0.0	75.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
0.0	0.0	0.0	0.0	5.9	0.0	88.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	86.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
2.3	2.3	0.0	2.3	4.7	2.3	2.3	4.7	2.3	0.0	0.0	2.3	4.7	2.3	2.3	0.0	2.3
0.0	0.0	0.0	0.0	14.0	0.0	62.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	4.0
0.0	2.0	0.0	0.0	14.0	2.0	26.0	4.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	4.0
0.0	0.0	0.0	0.0	9.1	0.0	72.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	13.3	0.0	53.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	12.5	0.0	60.4	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	2.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	16.7	0.0	83.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	20.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	10.5	0.0	73.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	16.7	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0	0.0	76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	4.0
0.0	2.3	0.0	0.0	4.5	2.3	47.7	2.3	0.0	0.0	0.0	2.3	2.3	0.0	0.0	0.0	4.5
0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Idde	Irvl	Jenn	Leib	Mapl	Many	Medi	Mend	Milli	Onef	Orio	Patr	Plap	Raln	Rals	Rave	Redc
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	19.0	0.0	60.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	2.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	6.9	0.0	51.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	1.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	2.0	0.0	0.0	10.2	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	4.1
0.0	0.0	0.0	0.0	8.3	0.0	83.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	14.3	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	14.3
0.0	0.0	0.0	0.0	16.7	0.0	58.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	20.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	11.1	11.1	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	11.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	2.6	0.0	0.0	10.5	0.0	28.9	0.0	0.0	0.0	0.0	0.0	0.0	5.3	2.6	2.6	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	7.7	0.0	53.8	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	3.8
0.0	3.3	0.0	0.0	6.7	0.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.5	0.0	90.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.2	37.9	1.9	3.2	472.0	18.8	2603.2	22.3	3.4	0.0	7.0	8.6	19.5	10.7	43.0	5.9	87.5

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	2.6	2.6	0.0	0.0	2.6	0.0	0.0	5.1	0.0	100.0
2.2	4.3	3.2	0.0	2.2	4.3	1.1	0.0	3.2	3.2	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	5.7	0.0	0.0	0.0	2.9	0.0	0.0	5.7	0.0	102.9
0.0	1.7	0.8	1.7	1.7	0.8	0.8	0.8	1.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	4.7	2.3	2.3	2.3	2.3	0.0	0.0	2.3	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	100.0
0.0	4.0	2.0	0.0	2.0	2.0	0.0	0.0	4.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	3.4	0.0	1.7	3.4	0.0	0.0	0.0	5.2	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	2.6	0.0	2.6	0.0	2.6	2.6	2.6	2.6	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
2.2	32.9	11.0	10.5	11.6	17.5	4.6	3.5	41.3	3.2	4402.9

Functional Scores, 1970

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays
implement dealer	45	2.2	8.9	13.3	0.0	0.0	0.0	0.0	0.0	4.4	2.2	0.0	0.0
grain elevator	87	2.3	8.0	3.4	1.1	5.7	1.1	1.1	0.0	2.3	3.4	4.6	1.1
feedlot	16	18.8	6.3	6.3	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0
appliance/furniture sales	17	0.0	5.9	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
automobile sales	31	0.0	6.5	12.9	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auto service/garage	119	0.8	5.0	14.3	0.0	0.8	0.8	0.0	0.8	0.8	0.8	0.8	0.0
bakery	11	0.0	18.2	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
clothing store	51	0.0	2.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
confectionary	21	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dept. store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
florist/greenhouse	13	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
general store	30	3.3	6.7	0.0	0.0	3.3	3.3	0.0	3.3	3.3	3.3	3.3	3.3
grocery/meats	38	0.0	7.9	15.8	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hardware/bldg. supplies	42	0.0	7.1	9.5	0.0	4.8	4.8	2.4	0.0	4.8	0.0	0.0	0.0
jewelry	9	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pharmacy/drugs	19	0.0	21.1	10.5	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0
photographers	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
restaurant/cafe	71	0.0	2.8	8.5	0.0	2.8	0.0	0.0	1.4	1.4	0.0	0.0	0.0
sports store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
accountant	15	0.0	13.3	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
architect	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auctioneer	9	0.0	22.2	11.1	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0
barrister	17	0.0	5.9	29.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blacksmith	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
funeral home	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hair salon/barber	46	0.0	8.7	10.9	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
hotel/motel	63	0.0	1.6	19.0	0.0	1.6	1.6	1.6	1.6	1.6	0.0	0.0	0.0
laundry/dry cleaners	18	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
liquor store	5	0.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Functional Scores, 1970

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays
pool/billiards	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
taxi	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
tradesperson/contractor	43	0.0	7.0	34.9	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
theatre	5	0.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0
travel agency	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
trucking Co.	63	0.0	6.3	23.8	0.0	1.6	0.0	1.6	0.0	0.0	0.0	0.0	0.0
veterinarian	14	0.0	7.1	64.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
chiropractor	6	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
church	73	1.4	8.2	6.8	0.0	1.4	1.4	0.0	1.4	2.7	1.4	0.0	2.7
community hall	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
doctor	54	0.0	3.7	14.8	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0
dentist	11	0.0	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fire hall	11	9.1	9.1	9.1	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hospital/clinic	19	0.0	15.8	26.3	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0
optomitrist	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
police/RCMP	7	0.0	14.3	14.3	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0
post office	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
school	51	2.0	7.8	5.9	2.0	2.0	2.0	0.0	0.0	2.0	0.0	3.9	0.0
senior's home	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
town or MD office	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bank/credit union	27	0.0	7.4	18.5	0.0	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0
insurance	27	0.0	7.4	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
real estate	21	0.0	4.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1241	39.9	306.1	663.1	3.1	45.0	29.3	6.7	28.5	52.7	17.5	12.7	7.2

Hild	Idde	Irvi	Jenn	Leib	Mapl	Marry	Medl	Merd	Milli	Onef	Orlo	Patr	Plap	Raln	Rals	Rave
0.0	0.0	0.0	0.0	0.0	11.1	0.0	40.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.7	1.1	5.7	1.1	0.0	2.3	1.1	4.6	5.7	1.1	0.0	2.3	1.1	3.4	1.1	0.0	3.4
0.0	0.0	0.0	12.5	0.0	18.8	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0
0.0	0.0	0.0	0.0	0.0	5.9	0.0	76.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	25.8	0.0	45.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.5	0.8	1.7	0.8	0.8	15.1	0.8	30.3	1.7	0.0	0.0	1.7	0.8	2.5	0.0	0.8	0.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.8	0.0	76.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.8	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	15.4	0.0	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	3.3	3.3	0.0	3.3	3.3	0.0	0.0	3.3	3.3	0.0	3.3	3.3	3.3	3.3	0.0	0.0
0.0	0.0	0.0	0.0	0.0	5.3	0.0	60.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
0.0	0.0	0.0	0.0	0.0	11.9	0.0	35.7	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	22.2	0.0	55.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	15.8	0.0	42.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.4	0.0	1.4	0.0	0.0	7.0	1.4	64.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	20.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.8	0.0	52.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	25.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	8.7	0.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0
1.6	0.0	1.6	1.6	1.6	6.3	1.6	46.0	1.6	0.0	0.0	0.0	1.6	1.6	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.1	0.0	61.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	20.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Hild	Idde	Irvi	Jenn	Leib	Mapl	Many	Medl	Mend	Milli	Onef	Orlo	Patr	Plap	Raln	Rals	Rave
0.0	0.0	0.0	0.0	0.0	25.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	9.3	0.0	20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.1	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	7.1	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.1	0.0	2.7	0.0	0.0	8.2	0.0	45.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	9.3	0.0	61.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0
0.0	0.0	0.0	0.0	0.0	9.1	0.0	72.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	9.1	0.0	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	9.1
0.0	0.0	0.0	0.0	0.0	10.5	0.0	36.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	14.3	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	2.0	2.0	2.0	3.9	0.0	35.3	0.0	0.0	0.0	0.0	2.0	0.0	2.0	2.0	2.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.1	0.0	37.0	3.7	0.0	0.0	0.0	0.0	3.7	0.0	3.7	0.0
0.0	0.0	0.0	0.0	0.0	3.7	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.8	0.0	76.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22.0	5.3	18.5	18.0	7.7	415.9	5.0	2153.9	18.3	4.5	0.0	9.7	8.9	14.6	12.7	36.9	16.7

Redc	Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
6.7	0.0	2.2	2.2	0.0	0.0	2.2	0.0	0.0	2.2	0.0	100.0
0.0	2.3	4.6	3.4	0.0	2.3	4.6	1.1	0.0	3.4	3.4	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
3.2	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
4.2	0.0	2.5	0.8	1.7	0.8	0.8	1.7	0.8	0.0	0.0	100.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
3.3	0.0	3.3	3.3	3.3	3.3	3.3	0.0	0.0	6.7	0.0	100.0
5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
7.1	0.0	2.4	2.4	0.0	2.4	0.0	0.0	0.0	2.4	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.2	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100

Redc	Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
2.7	0.0	1.4	0.0	1.4	1.4	0.0	0.0	0.0	2.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	9.1	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.9	0.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.7	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
184.7	2.3	26.9	14.2	9.8	12.2	13.0	11.9	2.8	38.5	3.4	4300.0

Functional Scores, 1980

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays	Hild
implement dealer	46	2.2	8.7	8.7	0.0	2.2	0.0	0.0	0.0	2.2	2.2	2.2	0.0	0.0
grain elevator	71	4.2	7.0	2.8	1.4	2.8	1.4	1.4	0.0	2.8	4.2	2.8	1.4	5.6
feedlot	29	13.8	3.4	10.3	0.0	0.0	3.4	0.0	0.0	0.0	3.4	0.0	0.0	0.0
appliance/furniture sales	37	0.0	0.0	29.7	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
automobile sales	50	0.0	8.0	24.0	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
auto service/garage	143	0.7	4.2	28.7	0.0	1.4	0.0	0.0	0.7	0.0	0.0	0.0	0.7	2.1
bakery	14	0.0	14.3	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
clothing store	65	0.0	3.1	27.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
confectionary	25	0.0	4.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dept. store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
florist/greenhouse	19	0.0	0.0	15.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
general store	28	3.6	3.6	0.0	0.0	7.1	10.7	3.6	7.1	3.6	3.6	3.6	3.6	3.6
grocery/meats	42	0.0	7.1	14.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hardware/bldg. supplies	59	0.0	3.4	11.9	0.0	5.1	0.0	1.7	0.0	1.7	0.0	0.0	0.0	0.0
jewelry	17	0.0	0.0	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pharmacy/drugs	26	0.0	0.0	23.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
photographers	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
restaurant/cafe	117	0.0	2.6	14.5	0.0	1.7	0.9	0.0	0.9	0.9	0.0	0.0	0.0	0.0
sports store	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
accountant	34	0.0	5.9	26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
architect	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auctioneer	17	0.0	5.9	23.5	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0
barrister	45	0.0	4.4	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blacksmith	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
funeral home	6	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hair salon/barber	50	0.0	12.0	12.0	0.0	2.0	2.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
hotel/motel	71	0.0	1.4	16.9	0.0	2.8	1.4	1.4	1.4	1.4	0.0	0.0	0.0	1.4
laundry/dry cleaners	17	0.0	0.0	23.5	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0
liquor store	8	0.0	12.5	12.5	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0

Functional Scores, 1980

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays	Hild
pool/billiards	5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
taxi	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
tradesperson/contractor	118	0.0	6.8	49.2	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
theatre	5	0.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
travel agency	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
trucking Co.	143	0.0	2.8	25.9	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
veterinarian	14	0.0	7.1	21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
chiropractor	4	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
church	89	1.1	6.7	11.2	1.1	0.0	1.1	0.0	1.1	1.1	1.1	0.0	2.2	2.2
community hall	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
doctor	64	0.0	3.1	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dentist	20	0.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fire hall	10	0.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hospital/clinic	35	0.0	17.1	14.3	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0
optomitrist	11	0.0	9.1	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
police/RCMP	7	0.0	14.3	14.3	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
post office	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
school	51	2.0	7.8	13.7	2.0	2.0	2.0	0.0	0.0	2.0	0.0	3.9	0.0	0.0
senior's home	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
town or MD office	15	0.0	6.7	6.7	0.0	13.3	13.3	0.0	0.0	6.7	6.7	0.0	0.0	0.0
bank/credit union	42	0.0	4.8	21.4	0.0	2.4	2.4	0.0	0.0	2.4	0.0	0.0	0.0	0.0
insurance	29	0.0	10.3	24.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
real estate	51	0.0	2.0	23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1759	27.5	245.2	822.0	4.5	51.6	52.9	8.8	37.1	49.0	24.1	12.5	7.9	15.0

Idde	Iml	Jenn	Leib	Mapl	Many	Madl	Merd	Milll	Oned	Orio	Patr	Plap	Rain	Rais	Rave	Redc
0.0	0.0	0.0	0.0	8.7	0.0	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
1.4	4.2	1.4	0.0	2.8	1.4	7.0	7.0	0.0	0.0	2.8	4.2	1.4	0.0	0.0	4.2	0.0
0.0	0.0	3.4	0.0	10.3	0.0	34.5	0.0	0.0	0.0	0.0	0.0	3.4	10.3	0.0	0.0	0.0
0.0	0.0	0.0	0.0	5.4	0.0	59.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	6.0	0.0	52.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
0.7	1.4	1.4	0.7	9.1	0.7	31.5	0.7	0.0	0.0	0.7	0.7	1.4	1.4	0.0	0.0	4.9
0.0	0.0	0.0	0.0	14.3	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
0.0	0.0	0.0	0.0	9.2	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0	0.0	48.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	16.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	5.3	0.0	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.3
3.6	3.6	0.0	3.6	0.0	0.0	0.0	3.6	3.6	0.0	3.6	3.6	3.6	3.6	0.0	0.0	3.6
0.0	0.0	0.0	0.0	9.5	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	7.1
0.0	0.0	0.0	0.0	8.5	0.0	54.2	1.7	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	3.4
0.0	0.0	0.0	0.0	5.9	0.0	70.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
0.0	0.0	0.0	0.0	3.8	0.0	65.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.9	0.0	0.0	6.0	0.9	64.1	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.9	0.0	3.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	17.6	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	5.9	0.0	58.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	17.8	0.0	62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	33.3	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	8.0	0.0	52.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	6.0
0.0	1.4	1.4	0.0	4.2	1.4	56.3	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	2.8
0.0	0.0	0.0	0.0	11.8	0.0	47.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8
0.0	0.0	0.0	0.0	12.5	0.0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5

Idde	Invi	Jenn	Leib	Mapl	Many	Medl	Merd	Milli	Onef	Orlo	Patr	Plap	Raln	Rals	Rave	Redc
0.0	0.0	0.0	0.0	20.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7
0.0	0.0	0.0	0.0	10.2	0.0	23.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.9	1.4	43.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
0.0	0.0	0.0	0.0	14.3	0.0	42.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
0.0	0.0	0.0	0.0	25.0	0.0	225.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	2.2	0.0	0.0	9.0	0.0	48.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1	3.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	6.3	0.0	71.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
0.0	0.0	0.0	0.0	5.0	0.0	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	10.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	10.0
0.0	0.0	0.0	0.0	8.6	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	9.1	0.0	63.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	14.3	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	2.0	2.0	7.8	0.0	31.4	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	6.7	0.0	13.3	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
0.0	0.0	0.0	0.0	7.1	0.0	45.2	0.0	0.0	0.0	0.0	0.0	2.4	0.0	2.4	0.0	2.4
0.0	0.0	0.0	0.0	3.4	0.0	62.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	2.0	0.0	70.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
5.7	15.7	16.3	12.1	382.4	37.1	2341.7	13.0	3.6	0.0	8.8	11.9	15.0	19.3	24.7	7.3	227.5

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	100.0
2.8	5.6	4.2	0.0	0.0	2.8	1.4	0.0	2.8	4.2	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	100.0
0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.7	0.7	0.7	1.4	0.7	0.7	0.7	0.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	3.6	0.0	0.0	3.6	0.0	3.6	0.0	0.0	100.0
0.0	0.0	0.0	2.4	2.4	0.0	0.0	0.0	2.4	0.0	100.0
0.0	1.7	0.0	1.7	1.7	0.0	0.0	0.0	1.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100

Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	350.0
0.0	1.1	0.0	0.0	1.1	2.2	0.0	0.0	1.1	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
10.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	10.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.9	0.0	0.0	2.0	0.0	2.0	0.0	2.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	2.4	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
18.7	17.6	8.5	11.5	6.6	13.5	12.1	23.8	29.8	7.7	4650.0

Functional Scores, 1990

	Total		Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays
implement dealer		39	2.6	12.8	7.7	0.0	0.0	0.0	0.0	0.0	2.6	2.6	0.0	0.0
grain elevator		41	2.4	7.3	4.9	2.4	2.4	2.4	2.4	0.0	2.4	4.9	4.9	2.4
feedlot		24	16.7	4.2	8.3	0.0	0.0	4.2	0.0	8.3	0.0	4.2	0.0	0.0
appliance/furniture sales		36	0.0	0.0	41.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
automobile sales		75	0.0	5.3	18.7	0.0	1.3	0.0	0.0	0.0	1.3	0.0	0.0	0.0
auto service/garage		140	0.7	5.7	17.9	0.0	0.7	1.4	0.7	1.4	0.0	0.0	0.7	0.7
bakery		14	0.0	7.1	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
clothing store		70	0.0	1.4	28.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
confectionary		30	0.0	3.3	23.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dept. store		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
florist/greenhouse		24	0.0	0.0	20.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
general store		23	4.3	8.7	0.0	0.0	4.3	0.0	0.0	4.3	4.3	4.3	0.0	4.3
grocery/meats		53	0.0	3.8	15.1	0.0	3.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0
hardware/bldg. supplies		53	0.0	3.8	17.0	0.0	3.8	1.9	1.9	0.0	0.0	0.0	0.0	0.0
jewelry		14	0.0	0.0	21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pharmacy/drugs		30	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
photographers		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
restaurant/cafe		150	0.0	1.3	14.0	0.0	0.7	0.7	0.0	0.7	0.0	0.0	0.0	0.0
sports store		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
accountant		33	0.0	6.1	27.3	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
architect		6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
auctioneer		14	0.0	7.1	21.4	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	0.0
barrister		43	0.0	2.3	18.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blacksmith		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
funeral home		4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hair salon/barber		83	0.0	7.2	13.3	0.0	1.2	1.2	0.0	0.0	1.2	0.0	0.0	0.0
hotel/motel		81	0.0	6.2	2.5	0.0	2.5	1.2	1.2	1.2	2.5	0.0	0.0	0.0
laundry/dry cleaners		21	0.0	0.0	23.8	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0
liquor store		9	0.0	11.1	11.1	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0

Functional Scores, 1990

	Total	Bind	Bowl	Broo	Buff	Burs	Cons	Dunm	Elkw	Empr	Etzl	Gold	Hays
pool/billiards	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
taxi	13	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
tradesperson/contractor	183	0.0	2.7	33.9	0.0	1.1	0.0	0.0	0.0	0.5	0.0	0.0	0.0
theatre	6	0.0	16.7	16.7	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0
travel agency	17	0.0	5.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
trucking Co.	159	0.0	3.1	24.5	0.0	0.0	0.6	1.3	0.0	0.0	0.0	0.0	0.0
veterinarian	20	0.0	5.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
chiropractor	18	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
church	95	1.1	6.3	10.5	1.1	2.1	0.0	0.0	0.0	1.1	1.1	1.1	2.1
community hall	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
doctor	70	0.0	4.3	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dentist	35	0.0	2.9	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fire hall	12	0.0	8.3	8.3	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0
hospital/clinic	26	0.0	19.2	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
optomitrist	10	0.0	10.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
police/RCMP	5	0.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
post office	35	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
school	53	1.9	7.5	15.1	1.9	1.9	1.9	0.0	0.0	1.9	0.0	1.9	0.0
senior's home	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
town or MD office	23	0.0	4.3	4.3	0.0	8.7	4.3	4.3	0.0	4.3	4.3	4.3	0.0
bank/credit union	21	0.0	4.8	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
insurance	39	0.0	5.1	23.1	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
real estate	42	0.0	2.4	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1996	32.5	236.3	768.2	8.2	43.0	24.6	14.7	48.6	50.4	24.2	15.7	12.5

Hild	Idde	Invl	Jenn	Leib	Mapl	Many	Medl	Merd	Milli	Onef	Orto	Patr	Plap	Rain	Rais	Rave
0.0	0.0	0.0	0.0	0.0	2.6	2.6	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.9	0.0	2.4	2.4	0.0	4.9	0.0	12.2	4.9	0.0	0.0	2.4	0.0	2.4	0.0	0.0	0.0
0.0	0.0	4.2	0.0	0.0	8.3	4.2	29.2	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0
0.0	0.0	0.0	0.0	0.0	2.8	0.0	55.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.3	0.0	0.0	0.0	0.0	6.7	0.0	57.3	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0
0.7	0.7	1.4	2.1	0.7	12.1	0.7	32.9	0.7	0.0	0.0	0.7	0.7	1.4	1.4	0.0	0.0
0.0	0.0	0.0	0.0	0.0	14.3	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	10.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	3.3	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.2	0.0	45.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.3	4.3	4.3	0.0	4.3	0.0	0.0	0.0	4.3	0.0	0.0	0.0	4.3	4.3	4.3	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.3	0.0	54.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	5.7	0.0	58.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	7.1	0.0	64.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	6.7	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.7	0.0	0.0	5.3	0.7	61.3	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.7	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	6.1	0.0	54.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.6	0.0	65.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	25.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	6.0	0.0	62.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0
0.0	0.0	1.2	1.2	0.0	7.4	1.2	64.2	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.8	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	11.1	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0

Hild	Idde	Irvi	Jenn	Lelb	Mapl	Many	Medi	Mend	Milll	Onef	Orlo	Patr	Plap	Raln	Rals	Rave
0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.5	0.0	0.0	6.6	1.1	49.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.9	1.9	44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	10.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.1	0.0	0.0	0.0	0.0	7.4	0.0	52.6	0.0	0.0	0.0	1.1	0.0	0.0	0.0	1.1	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.3	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	2.9	0.0	88.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	8.3	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0
0.0	0.0	0.0	0.0	0.0	15.4	0.0	46.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	10.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.9	2.9	2.9	2.9	0.0	2.9	2.9	2.9	2.9	2.9	0.0	2.9	2.9	2.9	2.9	2.9	0.0
1.9	0.0	1.9	0.0	0.0	3.8	1.9	34.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	1.9	1.9
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.3	0.0	4.3	0.0	0.0	8.7	4.3	13.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	9.5	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0
0.0	0.0	2.6	0.0	0.0	5.1	0.0	53.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21.4	7.9	26.5	8.7	5.1	293.9	21.4	2393.0	12.8	2.9	0.0	7.1	9.8	20.5	18.9	35.2	1.9

Redc	Retl	Rich	Robs	Rdl	Scan	Schu	Seve	Suff	Till	Wals	Total
2.6	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	100.0
0.0	0.0	7.3	4.9	0.0	0.0	4.9	2.4	0.0	2.4	2.4	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
5.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
4.3	0.0	0.7	0.0	0.7	1.4	0.0	0.7	0.7	2.9	2.1	100.0
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
4.3	0.0	4.3	4.3	4.3	4.3	0.0	0.0	4.3	4.3	0.0	100.0
5.7	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.9	0.0	100.0
3.8	0.0	1.9	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	100.0
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.0	0.7	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
2.5	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	100.0
9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Redc	Retl	Rich	Robs	Roll	Scan	Schu	Seve	Suff	Till	Wals	Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	100.0
4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
5.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	5.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
3.2	0.0	1.1	0.0	1.1	1.1	2.1	0.0	0.0	2.1	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
8.3	0.0	0.0	8.3	8.3	0.0	0.0	8.3	0.0	8.3	0.0	100.0
11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
2.9	0.0	2.9	2.9	2.9	2.9	2.9	2.9	0.0	2.9	2.9	100.0
5.7	0.0	1.9	0.0	0.0	0.0	1.9	0.0	1.9	3.8	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.7	0.0	4.3	0.0	4.3	0.0	0.0	0.0	0.0	4.3	0.0	100.0
4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
5.1	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	100.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
250.7	0.0	27.0	20.4	24.2	18.5	14.3	14.3	15.3	41.2	8.1	4600.0

Appendix D: Functions by Service Center Location in the Hierarchy

Functions by Service Center Location in the Hierarchy, 1950

Bundle of Functions		Total	Level 5 Leib	Mill	Seve	Suf	Jenn	Idde	Wals	Dun	Rals	One	Gold	Orl	Patr	Etz	Rich	Roll	Rave	Sch	Mend
Level 5	grain elevator	84		1	1		2	2	3	2			3	2	1	3	3		2	4	4
	auto service/garage	76				1				1			1			1	1	1		1	1
	post office	25									1	1		1	1	1	1			1	1
	restaurant/cafe	36													1						
	school	15																1			
	church	19																	2		
	general store	36																1		1	1
	hardware/bldg. supplies	31																			
	implement dealer	25																			
Level 4	automobile sales	19																			
	hotel/motel	16																			
	feedlot	11																			
	hair salon/barber	17																			
	pharmacy/drugs	12																			
	pool/billiards	5																			
	tradesperson/contracto	46																			
	doctor	22																			
	trucking Co.	9																			
	community hall	2																			
	senior's home	0																			
	bank/credit union	13																			
	insurance	23																			
	police/RCMP	6																			
	town or MD office	4																			
	theatre	3																			
	grocery/meats	53																			

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		Level 4													Level 3					Level 2		Level 1
Scan	Robs	Hild		Rain	Bind	Hays	Many	Irvi	Bur	Plap	Retl	Con	Till	Buf	Elkw	Emp	Bow	Redc	Mapl	Broc	Medi
2	3	5		1	3		2	5	4	3	2	1	3	1		4	5		2	3	2
1	1	1		1	1	1	1	4	2	4	1	2	2		1	2	5	2	6	4	26
1		1			1		1	1	1	1	1	1	1	1	1	1	1		1	1	1
					1	1			2	1		2			2	1	1	2	4	2	16
				2		1		1											1	2	7
					1	1								1		2	1		3	3	5
1	1	1		1	1		1	1	1	2	3	1	2		2	2	3	1	5	2	2
1	1	1		1	1	2	1	1	2	1	1		2			1	3	1	3	3	5
	1							1			2		2			1	2	1	2	4	9
		1			1						1		1			1	1		5	4	4
				1					2				1			1	1	1	2	3	4
								1			1			1		2			2		4
									1									1	4	2	9
											1							1	2	2	6
												1							1		3
												1	2			1	1	4	6	6	25
												1				1		1	3	3	13
													2					1		1	5
														1	1						
						1			1	1	1						1		1	3	4
							1										1		1	2	18
							1					1				1			1	1	1
										1							1	1		1	
															1						2
						2			2							1	1	3	5	5	34

6	7	10	7	10	9	8	15	18	14	14	11	18	5	8	23	29	27	76	82	306
																				1
																				1
																				1

Functions by Service Center Location in the Hierarchy, 1960

Bundle of Functions		Total	Level 5 Onef	Jenn	Retl	Leib	Wals	Mill	Suf	Buf	Idde	Seve	Rave	Orl	Hays	Patr	Roll	Rain	Robs	Dun	Scan
Level 5	grain elevator	93		1	2		3	1		1	1	1	3	2	1	1		1	3	1	2
	auto service/garage	118		1		1			1		1	1		1	1	1	2		1	1	2
	post office	0																			
	restaurant/cafe	48														1	1				
	school	38							1	1		1	1				1	2			
	church	58													2		1				2
	general store	43				1		1			1				1	1	1	1	1		1
	hardware/bldg. supplies	50												1				1	1		1
	implement dealer	39																	1		
	automobile sales	35																		1	
	hotel/motel	44														1				1	
	trucking Co.	50																		2	
	grocery/meats	50												1							
Level 4	police/RCMP	9																			
	feedlot	9																			
	hair salon/barber	25																			
	pharmacy/drugs	15																			
	tradesperson/contractor	63																			
	doctor	49																			
	bank/credit union	26																			
	insurance	30																			
	theatre	2																			
	clothing store	45																			
	florist/greenhouse	15																			
	appliance/furniture sales	25																			
	fire hall	7																			
	veterinarian	8																			
	hospital/clinic	12																			

Level 3	funeral home	6																			
Level 2	optomitrist	5																			
	laundry/dry cleaners	9																			
	bakery	16																			
	confectionary	17																			
	jewelry	11																			
	accountant	6																			
	auctioneer	5																			
	barrister	19																			
	dentist	12																			
	liquor store	2																			
	taxi	4																			
	chiropractor	4																			
	real estate	22																			
	dept. store	14																			
Level 1	photographers	0																			
	pool/billiards	2																			
	sports store	0																			
	architect	3																			
	community hall	0																			
	senior's home	0																			
	town or MD office	0																			
	blacksmith	0																			
	travel agency	0																			
	Total:	1163	0	2	2	2	3	2	2	2	3	3	4	5	5	5	6	5	7	6	8

Level 4																						Level 3	Level 2	Level 1
Blind	Etz	Schu	Many	Plap	Merd	Hild	Con	Gold	Bur	Rich	Irvi	Till	Rals	Elkw	Emp	Redc	Bow	Broo	Map	Medl
3	4	4	1	5	5	5	1	4	5	4	5	3		0	4	0	7	3	2	4
1	1	1		4	2	2	1	2	1	2	5	2	1	1	3	4	9	10	8	44
		1				1														
						1	1		1						1		2	1	6	29
1		1				1	1	1		1	1	1			1		4	2	4	11
					1			1		2	1	1	1		2	1	5	3	4	30
1		1	1	2	2	1	1	4	2	2	1	1	1	1	2	1	3	4	2	1
	1	1	1		2	1	1	2	2	2	1	2			2	2	4	2	7	13
	2	1			1	1		1		1	1	2			2	1	3	4	4	14
1		1					1	1	1	2						1	2	2	5	16
			1		1		1		1		1	1	1	1	1	2	1	6	2	21
				1				1	1		1	2		1	2	2	2	4	1	37
						1					2						2	3	7	31
1											1				1	2	3	3	7	31
			1													1	1	1		2
							1					1				1	1	2	3	3
									1		1		1			1	1	2	1	19
							1									1	2	2	2	8
									1		2					2	1	7	12	38
												2				2	1	6	5	28
							1				1		3		1	2	2	4	2	14
				1		1			1	1						1	1	4	2	24
											1			1				2	2	1
																1	1	4	5	34
									1				1			1	2	1	1	13
																1	1	1	1	12
																1	1	1		6
1															1	1	1	1	2	7

| | | |

Functions by Service Center Location in the Hierarchy, 1970

Bundles of Functions		Total	Level 5 Onef	Retl	Suf	Buf	Wals	Mill	Many	Idde	Dun	Hays	Leib	Patr	Ori	Roll	Seve	Scan	Rain	Gold	Sch
Level 5	grain elevator	87		2		1	3	1	1	1	1	1		1	2		1	2	1	4	4
	auto service/garage	119			1				1	1			1	1	2	2	2	1		1	1
	post office	0																			
	restaurant/cafe	71							1							1					
	school	51			1	1							1	1		1		1	1	2	1
	church	73										2				1		1			
	general store	30						1		1		1	1	1	1	1		1	1	1	1
	hardware/bldg. supplies	42									1				1			1			
	implement dealer	45																			1
	automobile sales	31																			
	bank/credit union	27																			
	fire hall	11															1				
	hotel/motel	63							1		1		1	1							
	trucking Co.	63									1										
	feedlot	16																	1		
Level 4	hair salon/barber	46																			
	pharmacy/drugs	19																			
	tradesperson/contractor	43																			
	doctor	54																			
	insurance	27																			
	police/RCMP	7																			
	theatre	5																			
	grocery/meats	38																			
	confectionary	21																			
	auctioneer	9																			
	hospital/clinic	19																			

Level 3	clothing store	51																			
	florist/greenhouse	13																			
	laundry/dry cleaners	18																			
	liquor store	5																			
	veterinarian	14																			
	real estate	21																			
	appliance/furniture sales	17																			
	bakery	11																			
	accountant	15																			
	barrister	17																			
	dentist	11																			
Level 2	jewelry	9																			
	chiropractor	6																			
	funeral home	4																			
	pool/billiards	4																			
	optomitrist	4																			
Level 1	taxi	3																			
	dept. store	0																			
	photographers	0																			
	sports store	0																			
	community hall	0																			
	senior's home	0																			
	architect	1																			
	blacksmith	0																			
	travel agency	0																			
	town or MD office	0																			
	Total:	1241	0	2	2	2	3	2	4	3	4	4	4	5	6	6	4	7	4	8	8

Level 4																	Level 3		Level 2		Level 1
Robs	Plap	Rave	Etz	Jenn	Mend	Irvi	Hild	Rich	Elkw	Con	Rais	Till	Bind	Bur	Emp		Redc	Bow	Mapl	Broo	Medl
3	3	3	3	1	5	5	5	4	0	1	0	3	2	5	2		0	7	2	3	4
1	3	1	1	1	2	2	3	3	1	1	1		1	1	1		5	6	18	17	36
						1	1		1		1			2	1		3	2	5	6	46
1		1		1		1		1		1	1	1	1	1	1		3	4	2	3	18
		1	1			2	3	1	1	1	1	2	1	1	2		2	6	6	5	33
1	1		1		1	1	2	1	1	1		2	1	1	1		1	2	1		
1								1		2		1		2	2		3	3	5	4	15
1			1		1			1				1	1		2		3	4	5	6	18
								1						1			1	2	8	4	14
	1				1			1			1			1	1		1	2	3	5	10
		1									1	1	1	1				1	1	1	2
	1			1	1	1	1	1	1	1		1		1	1		2	1	4	12	29
														1			21	4	7	15	14
			1	2									3					1	3	1	4
											1				1		2	4	4	5	29
															1		1	4	3	2	8
												2		1			9	3	4	15	9
											2				1		3	2	5	8	33
												1						2	1	5	18
										1							1	1	1	1	2
									1									1		1	2
											1			1			2	3	2	6	23
											1						3		1	1	15
															1			2		1	5
											1				1			3	2	5	7

8	9	7	8	6	11	13	15	15	6	9	12	15	11	20	19	71	81	117	174	536
																2	1	6	5	39
																1		2	1	8
																		2	4	11
																1	1	1	1	2
																1	1	1	9	2
																	1	1	3	16
																1	1	1	2	13
																2	2		1	7
																1	1	3	4	6
																2	1	2	5	9
																1	1	1	1	8
																		2	2	5
																		1	1	4
																		1	2	3
																			1	3
																			2	2
																			1	4
																			1	2
																				3
																				1

Functions by Service Center Location in the Hierarchy, 1980

Bundles of Functions		Total	Level 5 Onef	Mill	Buff	Idde	Scan	Rave	Wals	Hays	Robs	Dun	Orlo	Roll	Patr	Lelb	Seve	Gold	Mend
Level 5	grain elevator	71			1	1		3	3	1	3	1	2		3		1	2	5
	auto service/garage	143				1	2			1	1		1	1	1	1	1		1
	post office	0																	
	school	51			1			1						1	1	4		2	
	church	89			1		1	1		2									
	general store	28		1		1				1	1	1	1		1	1		1	1
	hardware/bldg. supplies	59					1					1	1	1					1
	implement dealer	46																1	
	fire hall	10															1		
	hotel/motel	71										1			1				
	trucking Co.	143										1							
	bank/credit union	42												2					
	feedlot	29							1										
Level 4	restaurant/cafe	117																	
	automobile sales	50																	
	tradesperson/contractor	118																	
	police/RCMP	7																	
	hair salon/barber	50																	
	town or MD office	15																	
	laundry/dry cleaners	17																	
	liquor store	8																	
	taxi	6																	
	veterinarian	14																	
	bakery	14																	
	auctioneer	17																	
	confectionary	25																	
	appliance/furniture sales	37																	
	hospital/clinic	35																	

Level 3	pharmacy/drugs	26																	
&	pool/billiards	5																	
Level 2	doctor	64																	
	insurance	29																	
	clothing store	65																	
	florist/greenhouse	19																	
	chiropractor	4																	
	real estate	51																	
	jewelry	17																	
	accountant	34																	
	barrister	45																	
	funeral home	6																	
	dentist	20																	
	optomitrist	11																	
Level 1	dept. store	0																	
	community hall	0																	
	senior's home	0																	
	photographers	0																	
	sports store	0																	
	architect	4																	
	blacksmith	0																	
	travel agency	0																	
	Total:	1759	0	1	3	3	5	5	4	5	5	5	5	6	7	6	3	6	8

Level 4																		Level 3			Level 2	Level 1
Schu	Hild	Plap	Invl	Jenn	Rich	Retl	Raln	Suff	Etzl	Rals	Blnd	Tll	Elkw	Many	Empr	Burs	Cons	Redc	Bow	Mapl	Broo	Medl
2	4	1	3	1	4	2			3		3	2		1	2	2	1			2	2	5
1	3	2	2	2	1		2	1			1	1	1	1		2		7	6	13	41	45
1		1	1	1		3				1	1	1		16	1	1	1	1	4		7	
2	2		2		1		1	1	1	1	1		2		1	2	3	3	6	8	10	43
1	1	1	1					1	1		1	1			1	3		1	1			
					1							1			1			2	2	5	7	32
1						1			1		1				1	1		3	4	4	4	25
										1						1			1	1	1	2
	1		1	1	1							1	1	1	1	2	1	2	1	3	12	40
														2				30	4	7	37	62
		1			1										1	1	1	1	2	3	9	19
		1		1			3		1		4						1	1	1	3	3	10
			1					1		1		1	1		1	2	1					
					1							2				1		1	1	1	1	4
				1					1						1	2	1	1	3	2	1	3
								1					1									
							1			1					2	1	1	3	6	8	12	28
												2				1	1	1	1	1	1	2
									1						2	1	2	1	3	6	4	26
				1											1	2	2	1	1	2	1	3
													1									
								1				1			1			2	1	2	4	8
														2				1	1	1	3	3
															1			1	1	1	1	4
							1											1	1	2	3	6
					1							2						1	2	2	2	7
																		1	1	1	4	10
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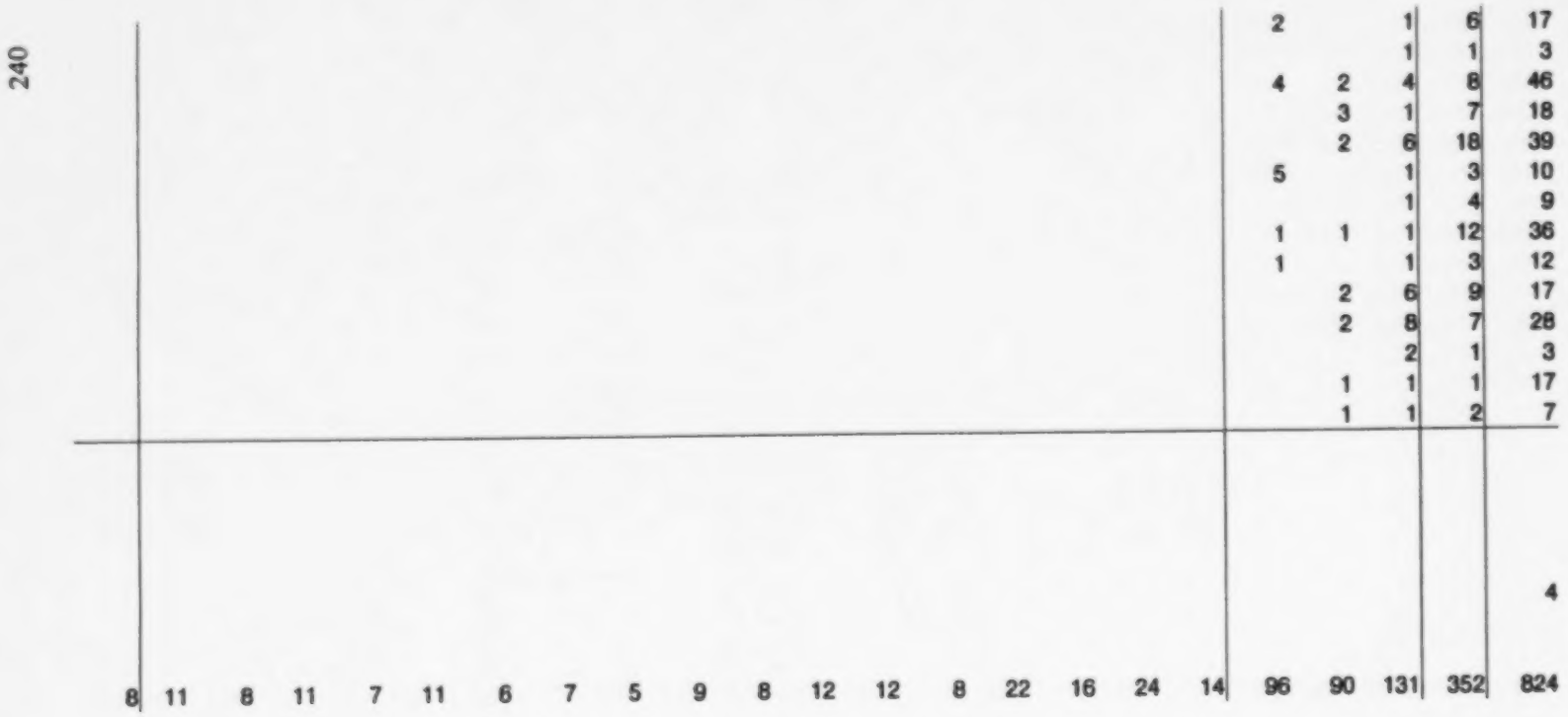
									1							1	1			2	11	22
																			6	3	5	20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1 1 1 12 36
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2 8 7 28
2 1 3
1 1 1 17
1 1 2 7
4
8 11 8 11 7 11 6 7 5 9 8 12 12 8 22 16 24 14 96 90 131 352 824

Functions by Service Center Location in the Hierarchy, 1990

Bundles of Functions		Total	Level 5 Onef	Retl	Rave	Mill	Leib	Orlo	Idde	Wals	Buff	Jenn	Patr	Hays	Men	Seve	Schu	Dunn	Lev Suff
Level 5	grain elevator	41						1		1	1	1		1	2	1	2	1	
	auto service/garage	140					1	1	1	3		3	1	1	1	1		1	1
	post office	35				1		1	1	1	1	1	1	1	1	1	1	1	
	restaurant/cafe	150								1			1						1
	school	53			1						1						1		1
	church	95						1			1			2			2		
	general store	23					1		1				1	1	1				1
	hardware/bldg. supplies	53																1	
	implement dealer	39															1		
	hotel/motel	81										1	1					1	
	trucking Co.	159																2	
	town or MD office	23																1	
	fire hall	12														1			
Level 4	automobile sales	75																	
	feedlot	24																	
	tradesperson/contractor	183																	
	bank/credit union	21																	
	insurance	39																	
	theatre	6																	
	grocery/meats	53																	
	florist/greenhouse	24																	
	laundry/dry cleaners	21																	
	liquor store	9																	
	veterinarian	20																	
	confectionary	30																	
	accountant	33																	
	taxi	13																	1
	auctioneer	14																	
	hair salon/barber	83																	

Level 3	pharmacy/drugs	30																	
	doctor	70																	
	police/RCMP	5																	
	clothing store	70																	
	real estate	42																	
	appliance/furniture sales	36																	
	bakery	14																	
	jewelry	14																	
	barrister	43																	
	funeral home	4																	
	dentist	35																	
	hospital/clinic	26																	
	optomitrist	10																	
	travel agency	17																	
Level 2	pool/billiards	4																	
	chiropractor	18																	
Level 1	dept. store	0																	
	community hall	0																	
	senior's home	0																	
	photographers	0																	
	sports store	0																	
	architect	6																	
	blacksmith	0																	
	Total:	1968	0	0	1	1	2	4	3	6	4	6	5	6	5	4	7	8	5

I 4	Gold	Scan	Raln	Robs	Plap	Hild	Man	Etzi	Roll	Con	Irvi	Rich	Rals	Blnd	Till	Burs	Elkw	Emp	Level 3 Bow	Redc	Mapl	Broo	Medi	Level 2	Level 1
	2			2	1	2		2		1	1	3		1	1	1		1		3	2	2	5		
	1	2	2		2	1	1		1	2	2	1		1	4	1	2		8	6	17	25	46		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
			1		1		1			1	1	1	1	1	3	1	1		2	14	8	21	92		
	1		1		1	1	1			1	1		1	1	2	1		1	4	3	2	8	18		
	1	1				1		1	1			1	1	1	2	2		1	6	3	7	10	50		
			1	1	1	1		1	1		1	1		1	1	1	1		2	2	3	9	31		
										1					2				5	1	1	3	24		
						1	1	1			1	1		1	1	2	1	2	5	2	6	2	52		
					1		3			1					1	2			5	36	3	39	70		
	1					1	1	1	1	1	1	1			1	2		1	1	2	2	1	3		
				1					1							1	1		1	1	1	1	2		1
													1											1	
							2				1			4			2		4	4	5	14	43		
								1			1					1			1		2	2	7		
							1			1	1					2		1	5	8	12	62	90		
							2				1		1			2			1	1	2	2	14		
									1								1		2	2	2	9	21		
										1						1			1			1	3		
		1													1	2			2	3	6	8	29		
																	1		1	2	1	5	11		
					1								1						1	1	2	1	12		
																	1		1	1	1	1	3		
		1													1				1	2	1	2	6		
																			1	1	2	1	8		
																			2	1	1	2	6		
																			1	2	1	7	18		
																			1	1	2	1	18		
																				1	1	1	10		
																		2		1	1	3	7		
										1								1				1	52		

| | | |

Appendix E: Relationship Between Functional Score and Population

Functional Score and Population, 1950

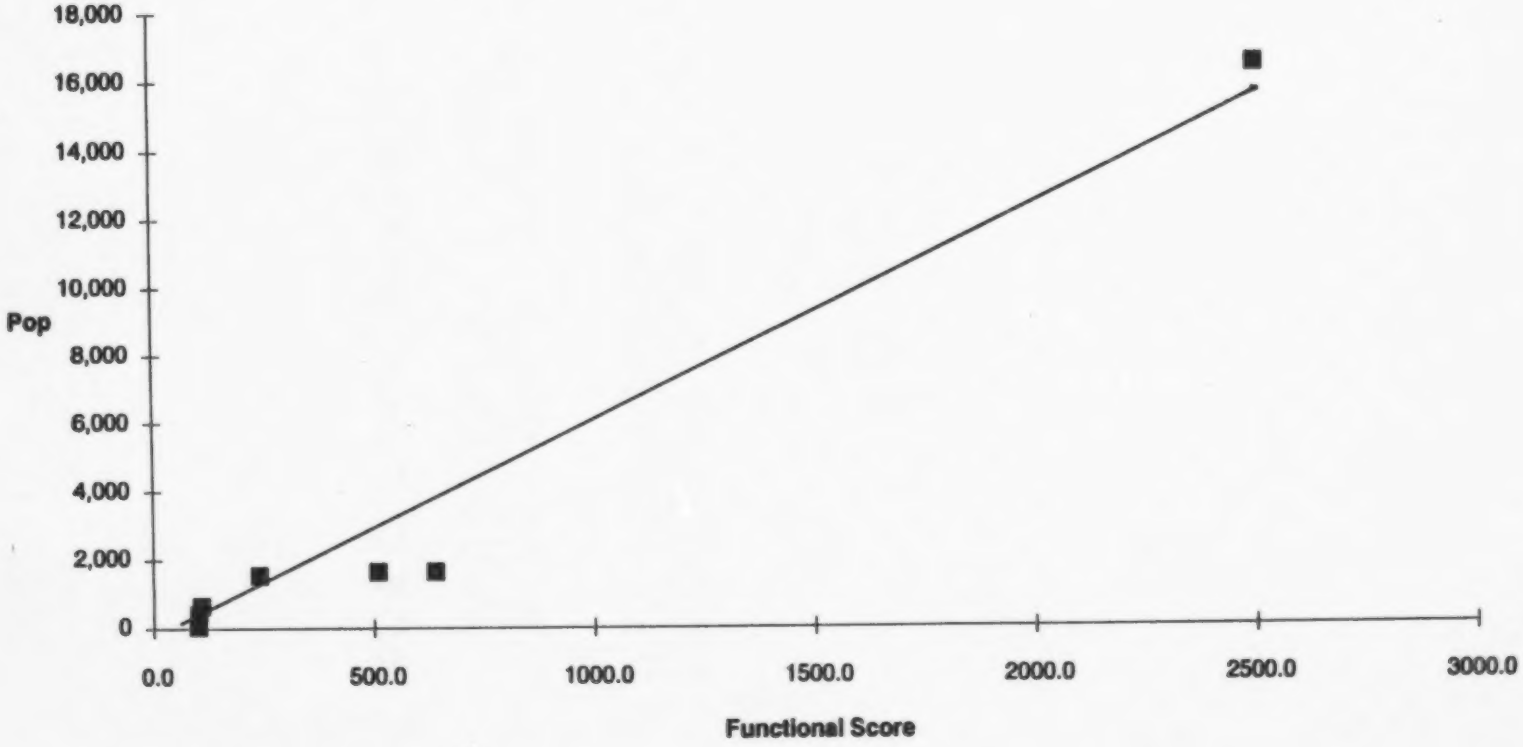
	Score x	Population y	x2	xy
Seven Persons	1.2	35	1.44	42
Suffield	1.3	259	1.69	336.7
Iddesleigh	2.4	35	5.76	84
Walsh	3.6	115	12.96	414
Dunmore	3.7	102	13.69	377.4
Ralston	4.0	455	16	1820
Golden Prairie	4.9	222	24.01	1087.8
Orion	6.4	54	40.96	345.6
Patricia	8.0	104	64	832
Etzikom	8.9	89	79.21	792.1
Richmond	8.9	165	79.21	1468.5
Rolling Hills	10.8	142	116.64	1533.6
Mendham	12.9	158	166.41	2038.2
Schuler	12.9	131	166.41	1689.9
Scandia	13.7	64	187.69	876.8
Robsart	14.9	107	222.01	1594.3
Hilda	22.5	169	506.25	3802.5
Rainier	28.1	66	789.61	1854.6
Hays	33.9	179	1149.21	6068.1
Manyberries	34.7	85	1204.09	2949.5
Irvine	41.0	224	1681	9184
Burstall	56.0	214	3136	11984
Piapot	57.1	245	3260.41	13989.5
Consul	59.5	105	3540.25	6247.5
Tilley	68.3	259	4664.89	17689.7
Elkwater	99.8	53	9960.04	5289.4
Empress	100.8	411	10160.64	41428.8
Bow Island	107.2	653	11491.84	70001.6
Redcliff	241.2	1,538	58177.44	370965.6
Maple Creek	509.9	1,638	259998.01	835216.2
Brooks	640.1	1,648	409728.01	1054884.8
Medicine Hat	2505.8	16,364	6279033.64	41004911.2
Total	4724.4	26088	7059679.42	43471799.9
average	147.6375	815.25		
number (n)	32			

regression equations

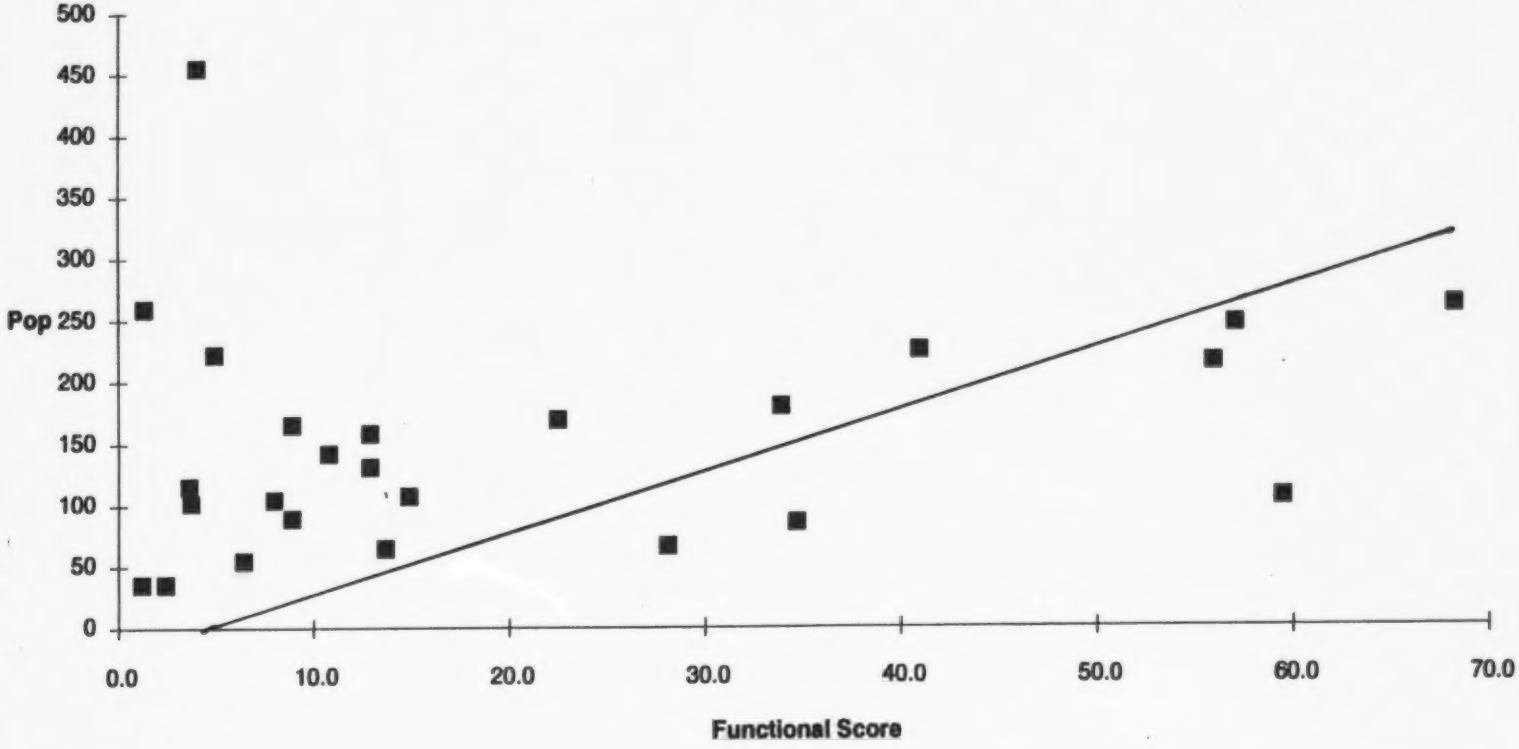
B $\frac{n(Exy)-ExEy}{n(Ex^2)-(Ex)^2}$ $\frac{32(43471799.9)-(4724.4)(26088)}{32(7059679.42)-(4724.4)^2}$ equals 6.23

A y-Bx 815.25-6.23(x)

Relationship between Functional Score and Population, Levels 1 to 3, 1950



Relationship between Functional Score and Population, Levels 4 and 5, 1950



Functional Score and Population, 1960

	Score	Population		
	x	y	x2	xy
Onefour	0.0	4	0	0
Walsh	3.2	97	10.24	310.4
Suffield	3.5	130	12.25	455
Iddesleigh	4.2	39	17.64	163.8
Seven Persons	4.6	27	21.16	124.2
Orion	7.0	27	49	189
Hays	7.7	141	59.29	1085.7
Patricia	8.6	75	73.96	645
Rolling Hills	10.5	171	110.25	1795.5
Rainier	10.7	48	114.49	513.6
Robsart	11.0	110	121	1210
Dunmore	11.1	104	123.21	1154.4
Scandia	11.6	51	134.56	591.6
Etzikom	14.3	101	204.49	1444.3
Schuler	17.5	156	306.25	2730
Manyberries	18.8	103	353.44	1936.4
Plapot	19.5	246	380.25	4797
Mendham	22.3	231	497.29	5151.3
Hilda	25.4	194	645.16	4927.6
Consul	26.4	172	696.96	4540.8
Golden Prairie	31.3	257	979.69	8044.1
Burstall	31.5	266	992.25	8379
Richmond	32.9	215	1082.41	7073.5
Irvine	37.9	240	1436.41	9096
Tilley	41.3	257	1705.69	10614.1
Ralston	43.0	780	1849	33540
Elkwater	55.4	99	3069.16	5484.6
Empress	57.7	405	3329.29	23368.5
Redcliff	87.5	2,221	7656.25	194337.5
Bow Island	193.5	1,122	37442.25	217107
Brooks	445.6	2,827	198559.4	1259711.2
Maple Creek	472.0	2,291	222784	1081352
Medicine Hat	2603.2	24,484	6776650	63736748.8
Total	4370.7	37691	7261467	66628621.9
average	132.4454545	1142.151515		
number (n)	33			

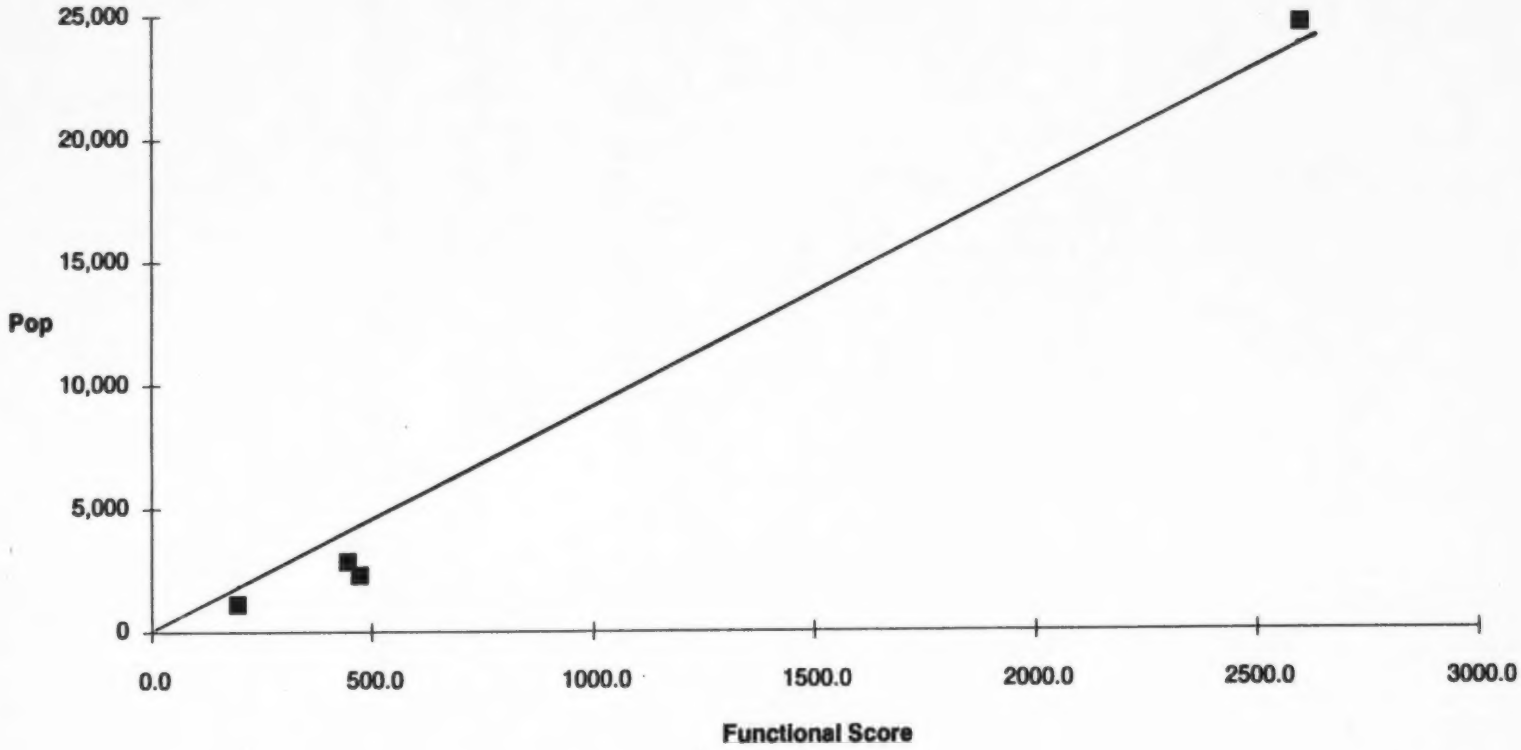
regression equations

B $\dfrac{n(Exy)-ExEy}{n(Ex^2)-(Ex)^2}$ $\dfrac{33(66628621.9)-(4370.7)(37691)}{33(7261467)-(4370.7)^2}$

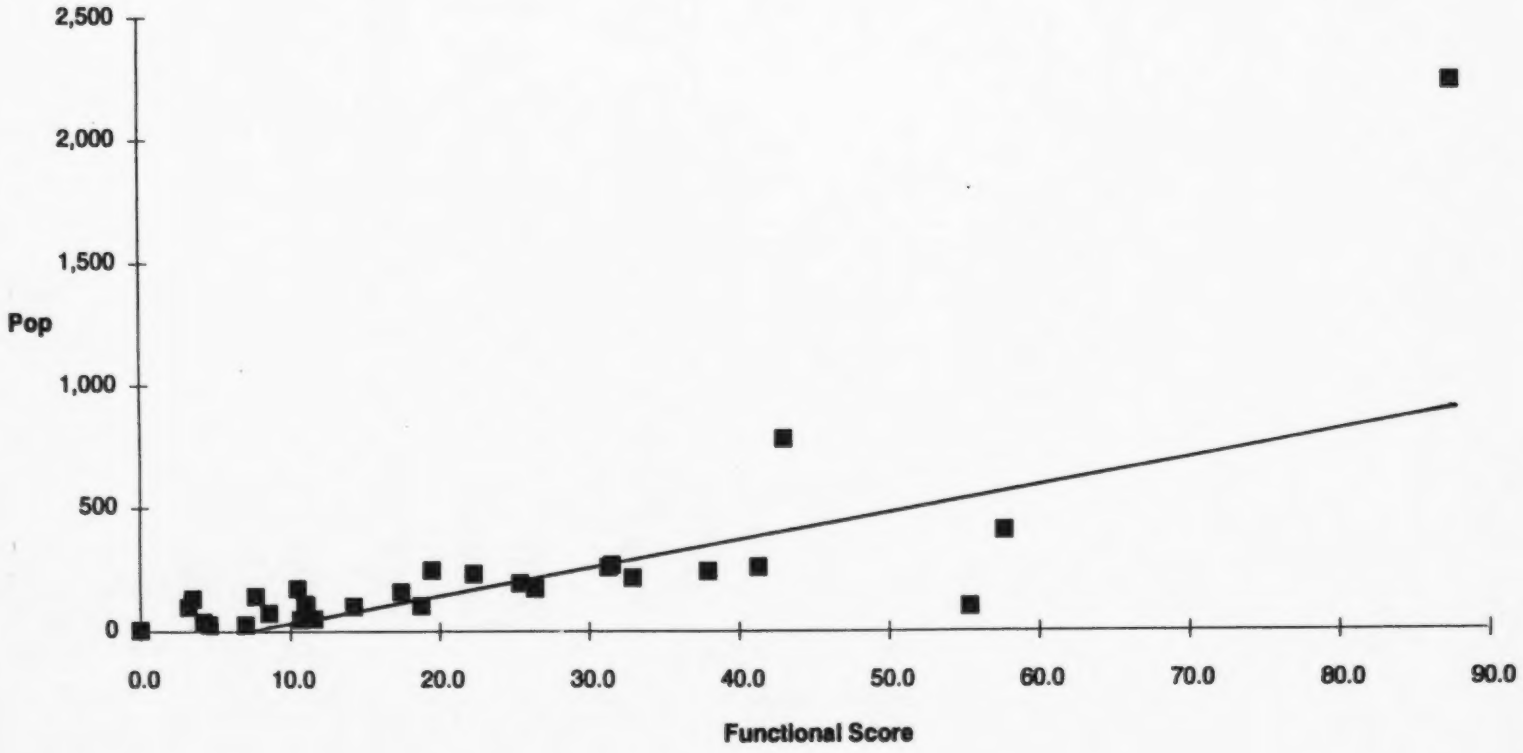
equals 9.22

A y-Bx 1142.15-9.22(x)

Relationship between Population and Functional Score, Levels 1 to 3, 1960



Relationship between Population and Functional Score, Levels 4 and 5, 1960



Functional Score and Population, 1970

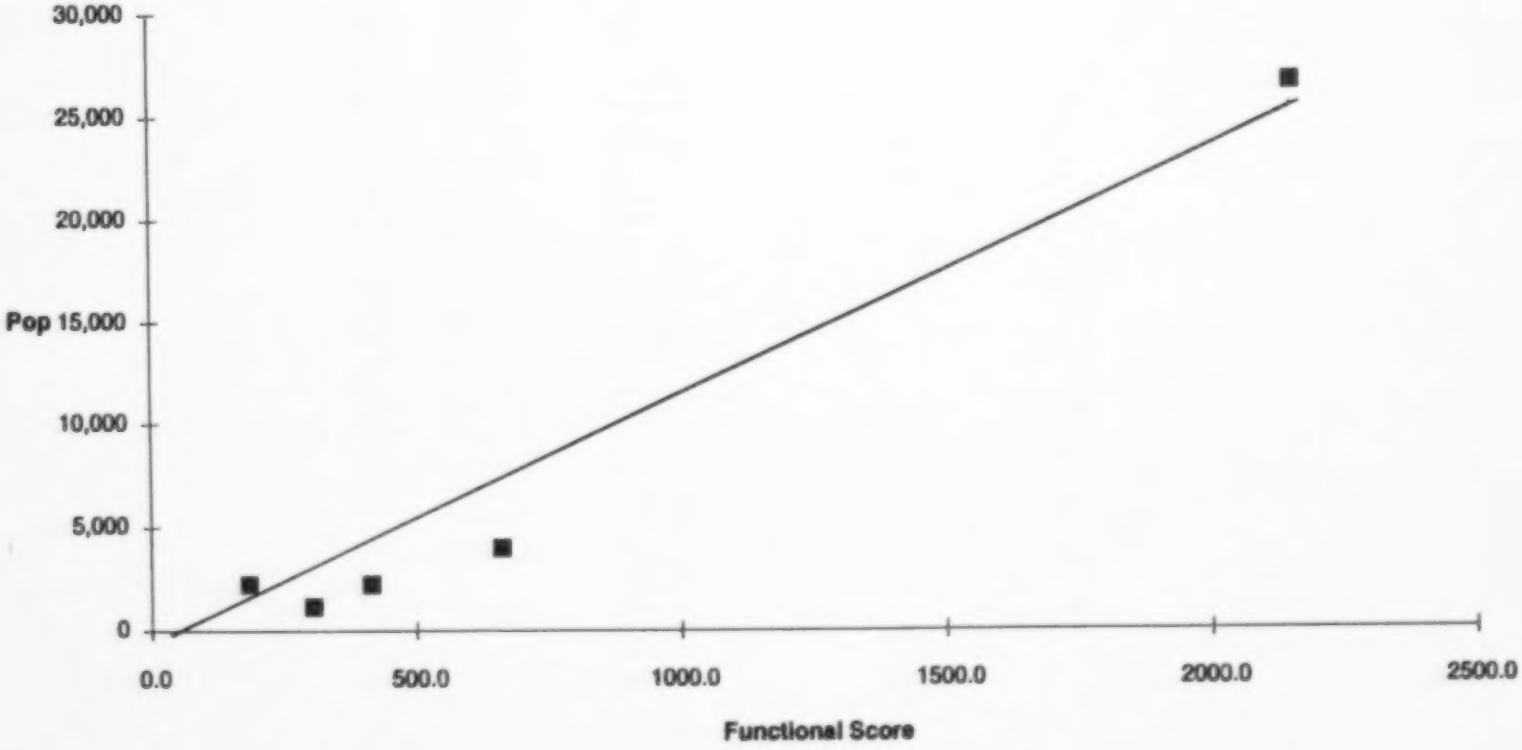
	Score x	Population y	x2	xy
Onefour	0.0	4	0	0
Retlaw	2.3	23	5.29	52.9
Suffield	2.8	70	7.84	196
Buffalo	3.1	13	9.61	40.3
Walsh	3.4	59	11.56	200.6
Millicent	4.5	11	20.25	49.5
Manyberries	5.0	81	25	405
Iddesleigh	5.3	15	28.09	79.5
Dunmore	6.7	64	44.89	428.8
Hays	7.2	125	51.84	900
Leibenthal	7.7	17	59.29	130.9
Patricia	8.9	30	79.21	267
Orion	9.7	17	94.09	164.9
Rolling Hills	9.8	127	96.04	1244.6
Seven Persons	11.9	57	141.61	678.3
Scandia	12.2	34	148.84	414.8
Golden Prairie	12.7	270	161.29	3429
Rainier	12.7	32	161.29	406.4
Schuler	13.0	97	169	1261
Robsart	14.2	52	201.64	738.4
Piapot	14.6	160	213.16	2336
Ravenscrag	16.7	22	278.89	367.4
Etzikom	17.5	92	306.25	1610
Jenner	18.0	61	324	1098
Mendham	18.3	141	334.89	2580.3
Irvine	18.5	194	342.25	3589
Hilda	22.0	82	484	1804
Richmond	26.9	208	723.61	5595.2
Elkwater	28.5	98	812.25	2793
Consul	29.3	205	858.49	6006.5
Ralston	36.9	357	1361.61	13173.3
Tilley	38.5	270	1482.25	10395
Bindloss	39.9	25	1592.01	997.5
Burstall	45.0	507	2025	22815
Empress	52.7	352	2777.29	18550.4
Redcliff	184.7	2,255	34114.09	416498.5
Bow Island	306.1	1,159	93697.21	354769.9
Maple Creek	415.9	2,268	172972.81	943261.2
Brooks	663.1	3,986	439701.61	2643116.6
Medicine Hat	2153.9	26,518	4639285.21	57117120.2
Total	4300.1	40158	5395203.55	61579564.9
average	107.5025	1003.95		
number (n)	40			

regression equations

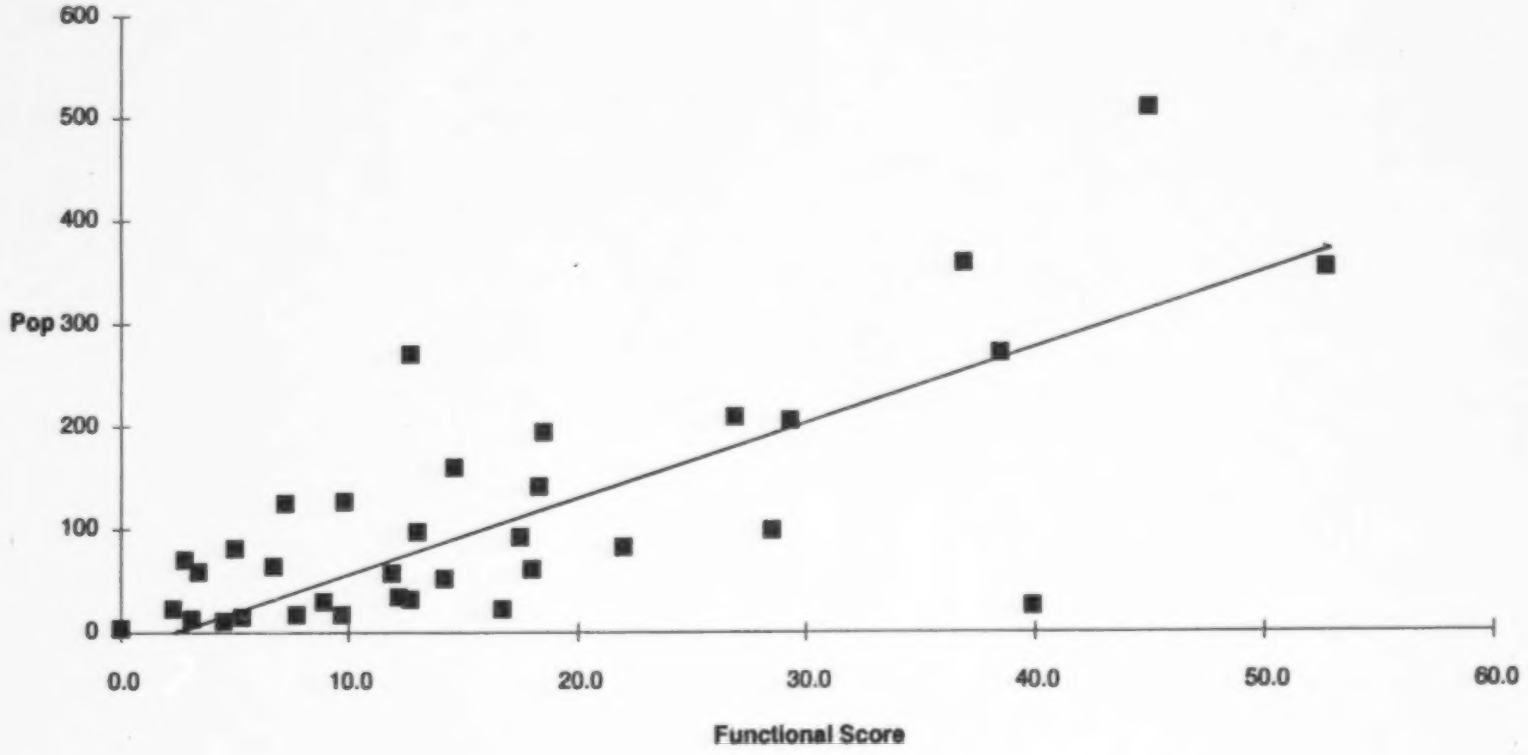
B $\frac{n(Exy)-ExEy}{n(Ex^2)-(Ex)^2}$ $\frac{40(61579564.9)-(4300.1)(40158)}{40(5395203.55)-(4300.1)^2}$ equals 11.61

A $y-Bx$ $1003.95-11.61(x)$

Relationship between Functional Score and Population, Levels 1 to 3, 1970



Relationship between Functional Score and Population, Levels 4 and 5, 1970



Functional Score and Population, 1980

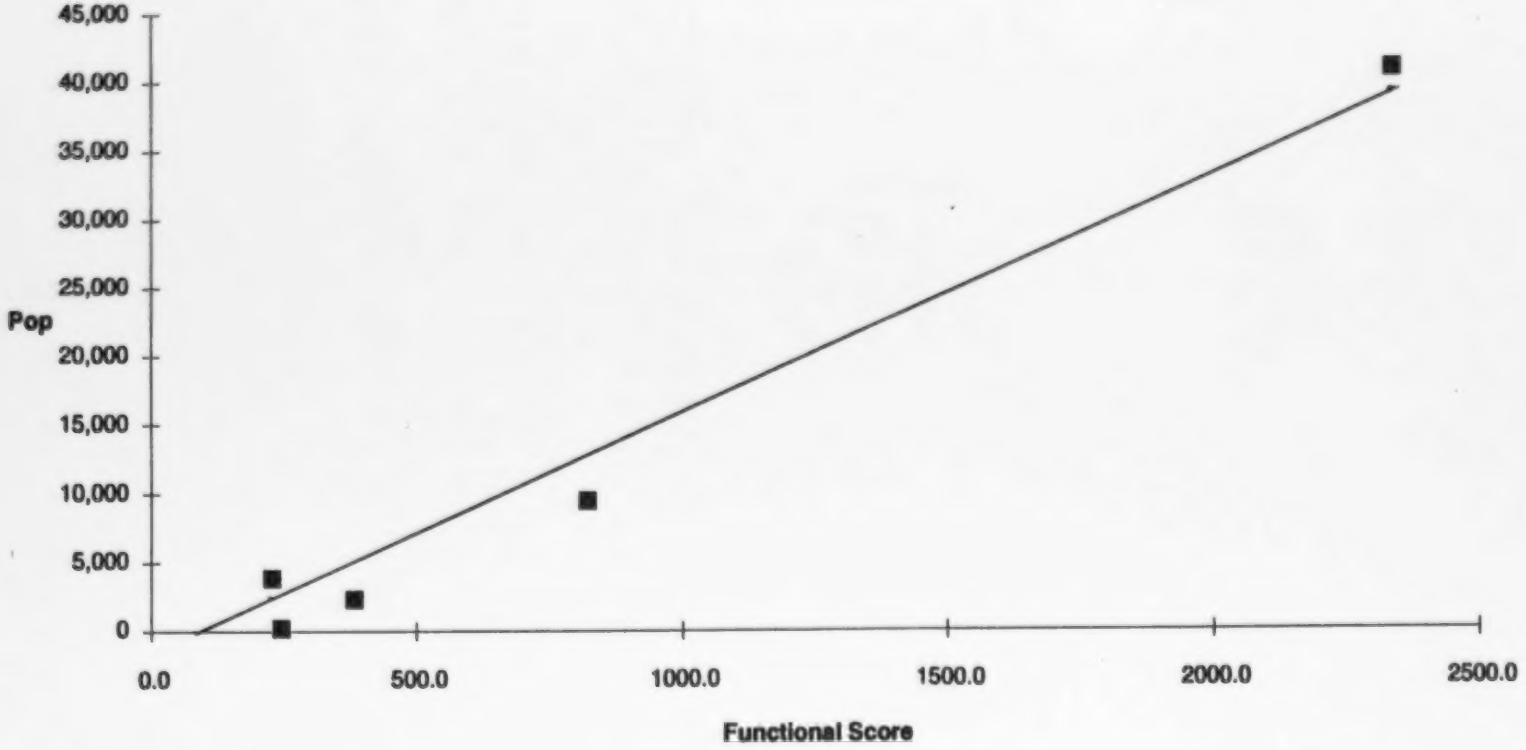
	Score	Population		
	x	y	x2	xy
Onefour	0.0	4	0	0
Millicent	3.6	6	12.96	21.6
Buffalo	4.5	9	20.25	40.5
Iddesleigh	5.7	18	32.49	102.6
Scandia	6.6	79	43.56	521.4
Ravenscrag	7.3	25	53.29	182.5
Walsh	7.7	70	59.29	539
Hays	7.9	118	62.41	932.2
Robsart	8.5	34	72.25	289
Dunmore	8.8	113	77.44	994.4
Orion	8.8	10	77.44	88
Rolling Hills	11.5	175	132.25	2012.5
Patricia	11.9	89	141.61	1059.1
Leibenthal	12.1	15	146.41	181.5
Seven Perso	12.1	146	146.41	1766.6
Golden Prairi	12.5	118	156.25	1475
Mendham	13.0	76	169	988
Schuler	13.5	105	182.25	1417.5
Hilda	15.0	75	225	1125
Piapot	15.0	95	225	1425
Irvine	15.7	360	246.49	5652
Jenner	16.3	55	265.69	896.5
Richmond	17.6	212	309.76	3731.2
Retlaw	18.7	12	349.69	224.4
Rainier	19.3	50	372.49	965
Suffield	23.8	200	566.44	4760
Etzikom	24.1	69	580.81	1662.9
Ralston	24.7	475	610.09	11732.5
Bindloss	27.5	20	756.25	550
Tilley	29.8	345	888.04	10281
Elkwater	31.7	89	1004.89	2821.3
Manyberries	37.1	88	1376.41	3264.8
Empress	49.0	299	2401	14651
Burstall	51.6	550	2662.56	28380
Consul	52.9	153	2798.41	8093.7
Redcliff	227.5	3,876	51756.25	881790
Bow Island	245.2	220	60123.04	53944
Maple Creek	382.4	2,321	146229.76	887550.4
Brooks	822.0	9,439	675684	7758858
Medicine Hat	2341.7	40,700	5483558.89	95307190
Total	4644.6	60913	6434576.52	105002160.1
average	116.115	1522.825		
number (n)	40			

regression equations

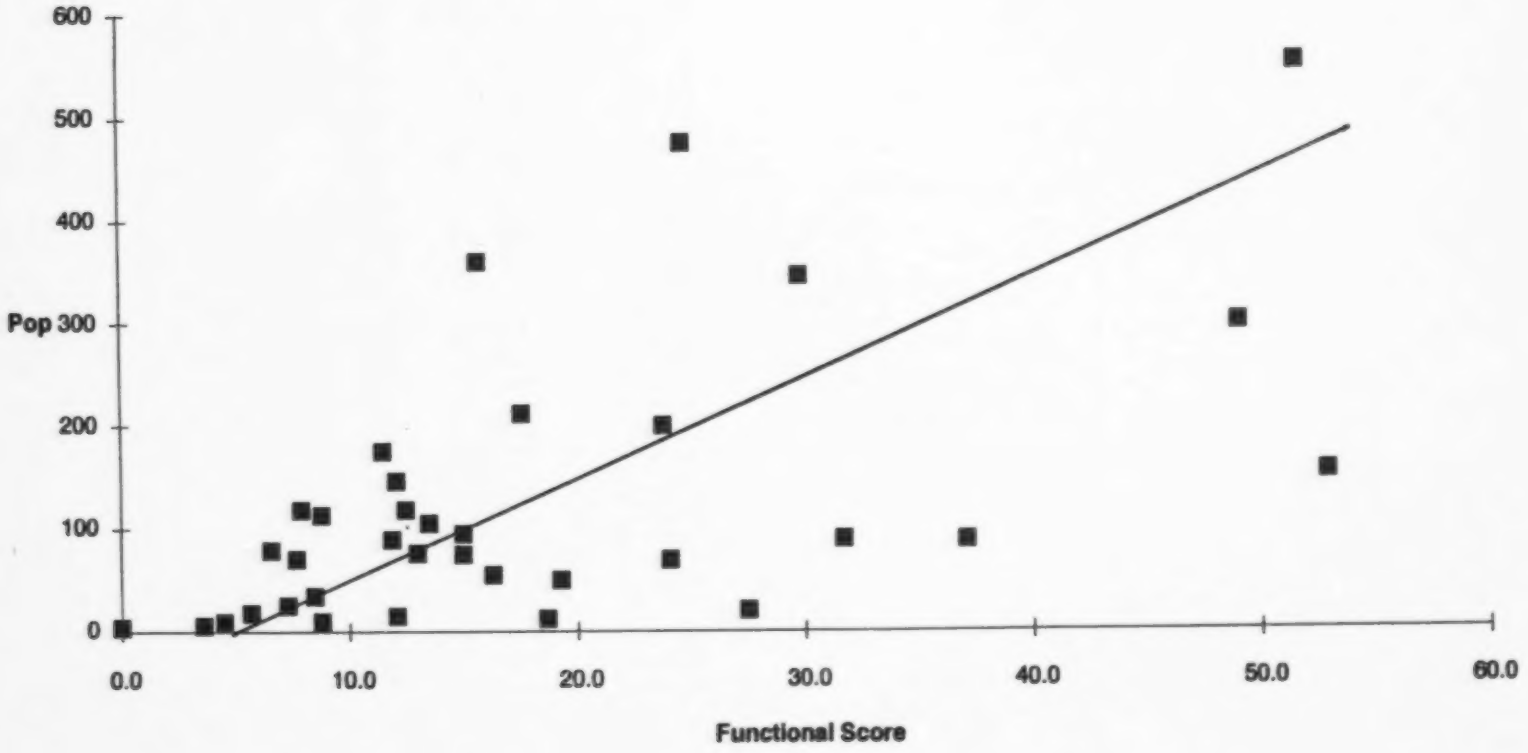
B $\dfrac{n(Exy)-ExEy}{n(Ex^2)-(Ex)^2}$ $\dfrac{40(105002160.1)-(4644.6)(60913}{40(6434576.52)-(4644.6)^2}$ equals 16.61

A y-Bx 1522.825-16.61(x)

Relationship between Functional Score and Population, Levels 1 to 3, 1980



Relationship between Functional Score and Population, Levels 4 and 5, 1980



Functional Score and Population, 1990

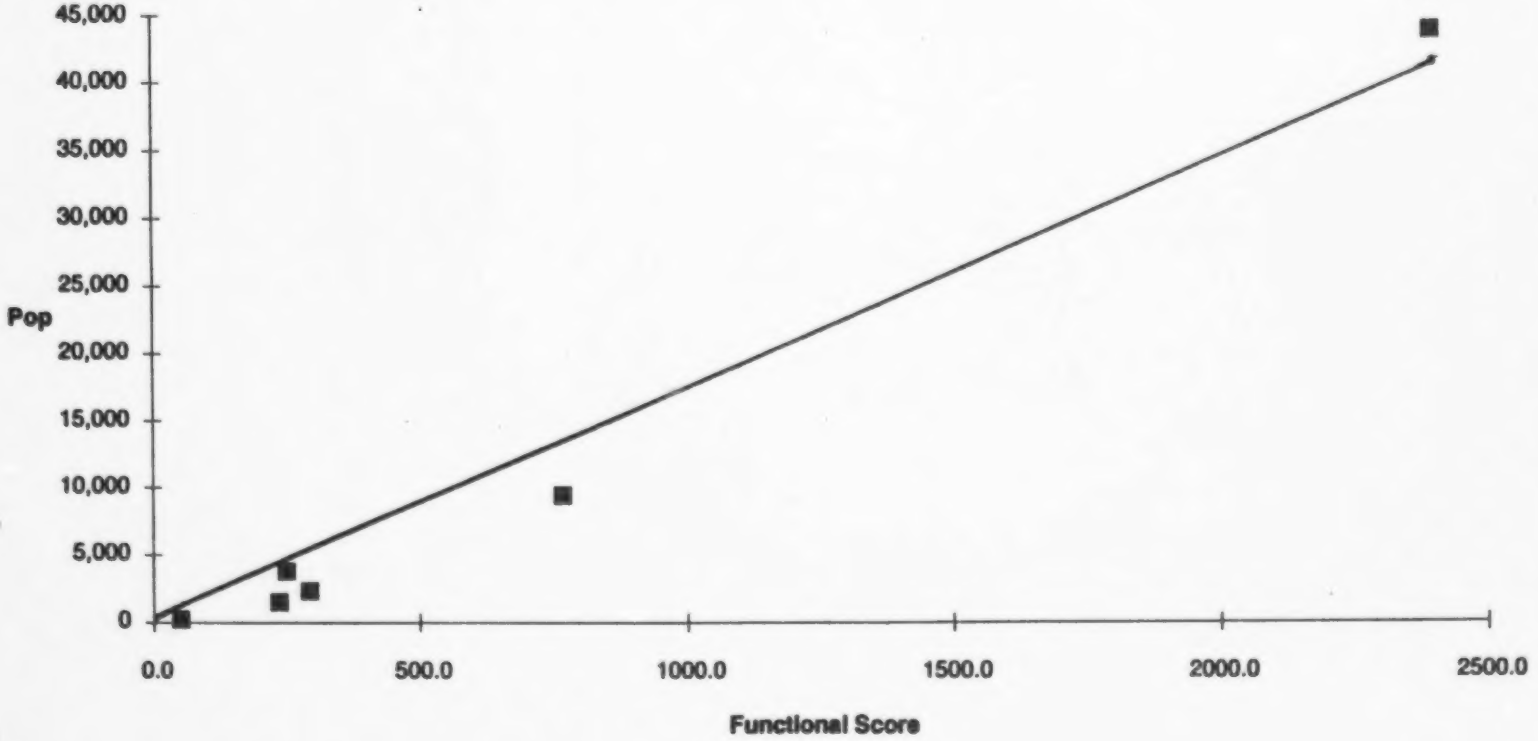
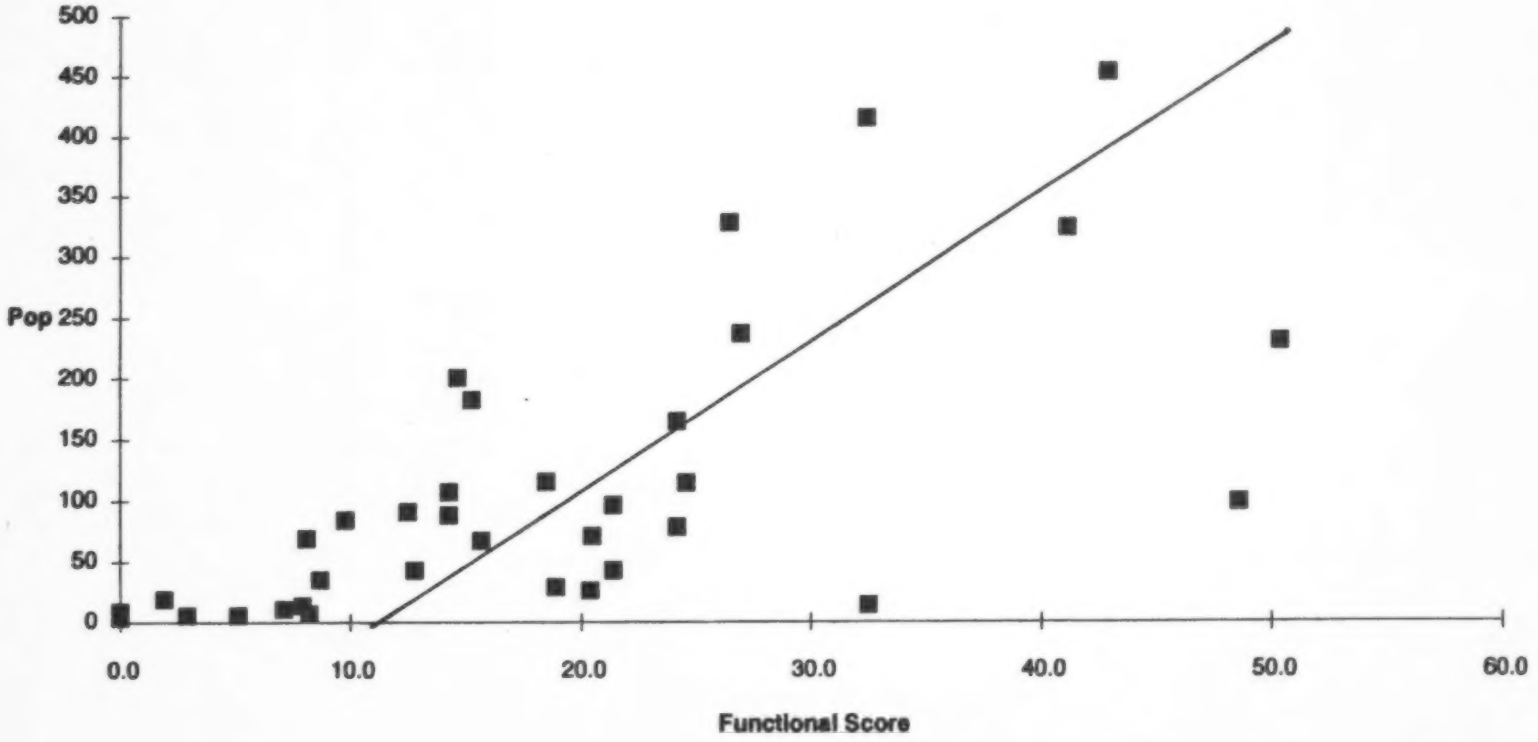
	Score x	Population y	x2	xy
Onefour	0.0	4	0	0
Retlaw	0.0	9	0	0
Ravenscrag	1.9	19	3.61	36.1
Millicent	2.9	6	8.41	17.4
Leibenthal	5.1	6	26.01	30.6
Orion	7.1	11	50.41	78.1
Iddesleigh	7.9	14	62.41	110.6
Walsh	8.1	69	65.61	558.9
Buffalo	8.2	7	67.24	57.4
Jenner	8.7	35	75.69	304.5
Patricia	9.8	84	96.04	823.2
Hays	12.5	91	156.25	1137.5
Mendham	12.8	43	163.84	550.4
Schuler	14.3	88	204.49	1258.4
Seven Perso	14.3	107	204.49	1530.1
Dunmore	14.7	200	216.09	2940
Suffield	15.3	182	234.09	2784.6
Golden Prairi	15.7	67	246.49	1051.9
Scandia	18.5	115	342.25	2127.5
Rainier	18.9	29	357.21	548.1
Robsart	20.4	26	416.16	530.4
Plapot	20.5	71	420.25	1455.5
Hilda	21.4	43	457.96	920.2
Manyberries	21.4	96	457.96	2054.4
Etzikom	24.2	78	585.64	1887.6
Rolling Hills	24.2	164	585.64	3968.8
Consul	24.6	114	605.16	2804.4
Irvine	26.5	326	702.25	8639
Richmond	27.0	236	729	6372
Bindloss	32.5	14	1056.25	455
Ralston	32.5	413	1056.25	13422.5
Tilley	41.2	322	1697.44	13266.4
Burstall	43.0	451	1849	19393
Elkwater	48.6	98	2361.96	4762.8
Empress	50.4	229	2540.16	11541.6
Bow Island	236.3	1,484	55837.69	350669.2
Redcliff	250.7	3,768	62850.49	944637.6
Maple Creek	293.9	2,334	86377.21	685962.6
Brooks	768.2	9,433	590131.24	7246430.6
Medicine Hat	2393.0	43,625	5726449	104394625
Total	4597.2	64511	6539747.34	113729743.9
average	114.93	1612.775		
number (n)	40			

regression equations

B $\frac{n(Exy)-ExEy}{n(Ex^2)-(Ex)^2}$ $\frac{40(113729743.9)-(4597.2)(64511)}{40(6539747.34)-(4597.2)^2}$ equals 17.69

A y-Bx 1612.775-17.69(x)

Relationship between Functional Score and Population, Levels 1 to 3, 1990



Relationship between Functional Score and Population, Levels 4 and 5, 1990